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A CHRONOLOGY of the

GEORGE C. MARSHALL ***SPACE
FLIGHT
CENTER***

JANUARY 1 - DECEMBER 31, 1967

MSFC Historical Report No. 7

(MHR-7)

A CHRONOLOGY OF THE GEORGE C. MARSHALL SPACE FLIGHT CENTER
FROM JANUARY 1 THROUGH DECEMBER 31
1967

Compiled by
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MSFC Historical Staff
Management Services Office
Administration and Technical Services
Marshall Space Flight Center
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Huntsville, Alabama
April 1970

FOREWORD

This is the twelfth periodic historical publication of the George C. Marshall Space Flight Center. It covers the period January 1--December 31, 1967, and relates chronologically our most important activities in support of the National Aeronautics and Space Administration.

Our principal mission in 1967 was to develop launch vehicles for advanced space exploration. The immediate objective was to provide the Saturn vehicles for the manned lunar landing, a major national goal.

We are hopeful that this report will be of interest and help to those engaged in space exploration and to future historians.

Eberhard Rees
for Eberhard Rees
Director

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PREFACE

MSFC Historical Report Number 7 is the second in a series of annual chronologies recording noteworthy events at the George C. Marshall Space Flight Center and its related government and contractor organizations. The preceding chronology in this series covered the period of January 1 through December 31, 1966. The chronologies succeed the semiannual and annual MSFC historical monographs numbering 1 through 11 (MHM-1 through MHM-11) previously published at this Center. The MHM series covered the period from July 1960, when NASA established this Center, through Calendar Year 1965.

This chronology is fully documented as an aid to technologists, future historians, and other students of space technology.

Appropriate portions of this report have been reviewed and approved by the Center's Offices of Deputy Director, Technical; Deputy Director, Management; and the offices of Program Development, Science and Engineering, Program Management, and Administration and Technical Services.

Our office gratefully acknowledges the valuable assistance and advice of many individuals who contributed to the preparation of this report. A list of acknowledgments would represent most of the offices and laboratories of the Marshall Center.

April 4, 1970

David S. Akens
Chief Historian

JANUARY 1967

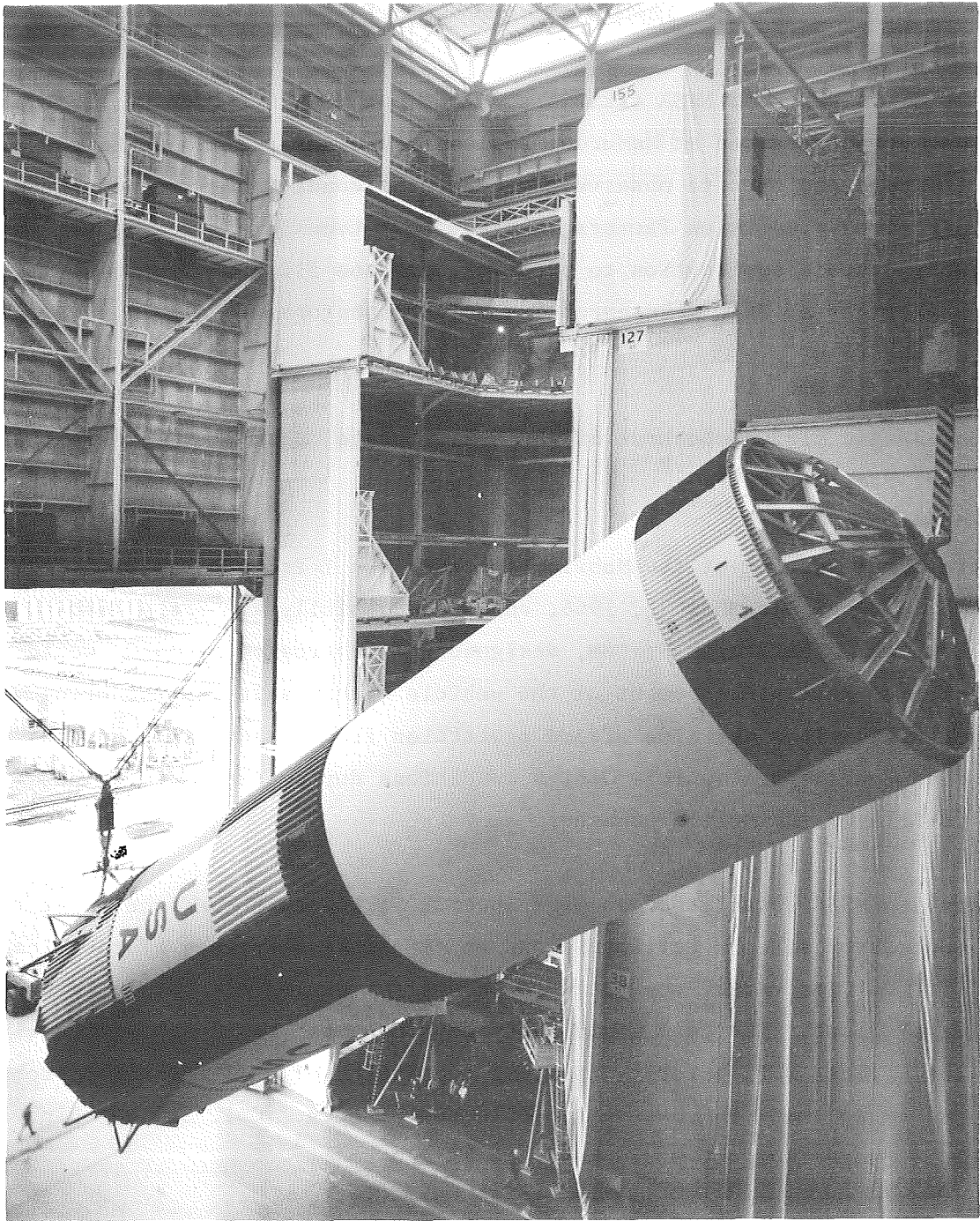
January 3: A group of NASA officials, headed by MSFC Director Dr. Wernher von Braun, arrived at McMurdo Station in the Antarctic beginning a 10-day expedition to observe environmental conditions--including temperatures, isolation factors, and survival techniques--for comparison and possible application to problems of space flight. Dr. Ernst Stuhlinger of MSFC's Research Projects Laboratory was also a member of the team.¹

- Post-static firing checkout of the S-II-1 stage began at Mississippi Test Facility (MTF*).²
- Structural testing of the Mobile Launcher (ML) 1 Primary Damper System which began December 23, 1966, ended successfully at MSFC's Test Complex. The Damper System, designed and fabricated by MSFC, would help to restrain movement of the vehicle within safe limits during critical winds and also afford protection from steady state ground wind loads above vehicle design conditions during exposure of the vehicle on the Mobile Launcher.³

January 5: MSFC established an S-II Special Task Team to be located at the contractor site in California and at MTF after emergence of technical difficulties caused the stage to become the pacing element in Saturn V development. The team would carry out "on-site" responsibilities with the highest MSFC priority insuring resolution of S-II technical problems and improvement in meeting schedule commitments. Col. Sam Yarchin, S-II Stage Manager, would head the 18-man team.⁴

January 6: The Boeing Company moved the S-IC-6 stage from the Vertical Assembly Building (VAB) at the Michoud Assembly Facility (MAF) to the Manufacturing Plant for installation of the stage systems.⁵

* Terms are identified on first usage in text; all further references are by acronym. As an aid to the reader, acronyms and abbreviations are listed and identified in the "Index".



S-IC-6 STAGE IN TRANSFER

The S-IC-6 stage is shown being moved from the vertical assembly position in the Vertical Assembly Building at Michoud to its transporter. The 180-ton overhead bridge crane attached to the forward handling ring, and the fixed hinge bridle connected to the aft end of the stage, controls movement during the laydown operation.

January 10: International Business Machines Corporation (IBM) began S-IU-503 checkout and systems testing.⁶

- MSFC executed a one-year \$10,451,092 renewal option of the cost-plus-award-fee contract with Mason-Rust Company for continued support services at MAF.⁷

January 11: Boeing moved the S-IC-4 stage from its storage area in the MAF Manufacturing Building to the VAB to incorporate an engineering change necessitated by stress corrosion. The change would involve replacement of 32 splice plates of the upper and lower thrust rings.⁸

- The S-II-1 ended initial post-static checkout at MTF. During this phase, program managers decided to defer a majority of the inspection and testing until the stage was shipped to Kennedy Space Center (KSC).⁹

January 12: The S-IVB-208 stage successfully achieved all test objectives during its acceptance firing. Mainstage duration was 424.3 seconds, with automatic cutoff initiated because of imminent liquid oxygen (LOX) depletion.¹⁰

- The S-II-1 stage was removed from the test stand and transferred to the MTF Service Building for shipment preparations.¹¹

January 13: MSFC completed modification of the Saturn V Dynamic Test Vehicle (SA-500D) attachment hardware to make it compatible with the SA-501 Command-to-Service Module attachment hardware. Technicians had noted a discrepancy in the size of the hardware when mating the SA-500D for Configuration I testing.¹²

- Douglas Aircraft Company (DAC) personnel completed tank installations in S-IVB-505, and moved the stage to Tower 4 of the Space Systems Center for structural assembly.¹³

January 16: Rework of the damaged S-II-3 liquid hydrogen (LH₂) bulkhead ended. To complete the S-II-3 rework, North American Aviation (NAA) Space and Information Systems Division (S&ID) technicians had removed and used cylinder 6 from the S-II-5 LH₂ bulkhead. Following pneumatic testing S-II-3 would enter Station IV for completion of systems installations.¹⁴

- MSFC completed conversion of an S-IVB stage mockup into an orbital workshop and crew quarters mockup. Modifications consisted of installing a floor, ceiling, crew compartments, mockup experiments, and other items simulating the workshop.¹⁵
- MSFC awarded Sanders Associates, Inc., a \$2,149,548 contract for logistic support of Saturn V operational display systems used to present information on vehicle status during simulated and actual launch preparations.¹⁶

January 17: Clustering of the S-IB-12 stage began at MAF.¹⁷

January 18: The S-II-2 interstage was shipped via a commercial freighter to KSC for use during the erection of the S-II-1 stage in the VAB low bay at KSC.¹⁸

- Douglas completed preparations for airlifting the S-IVB-504 stage from the Space Systems Center to the Sacramento Test Center (SACTO).¹⁹

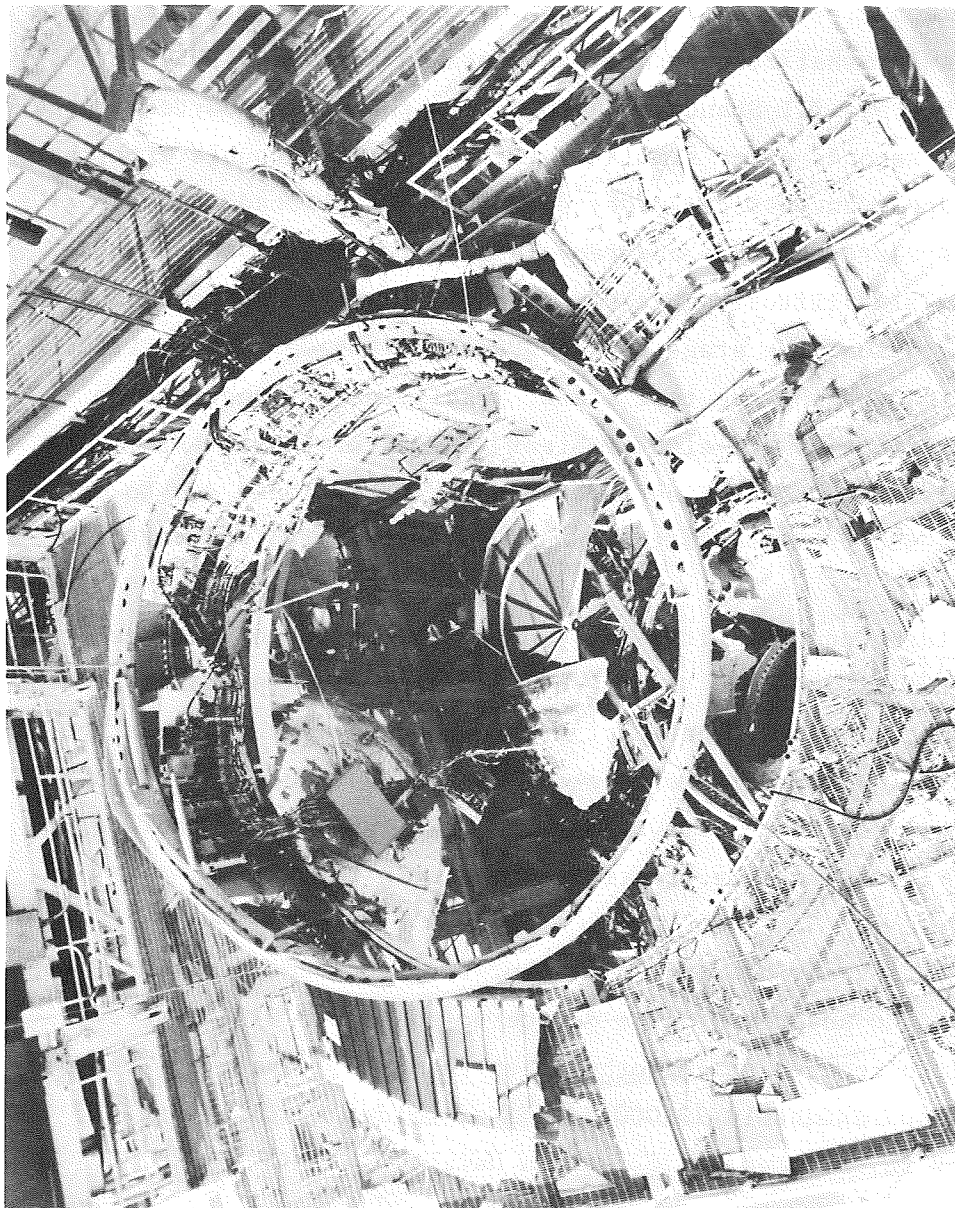
January 19: The S-IB-9 stage left the Chrysler Corporation Space Division (CCSD) facility at MAF aboard the Palaemon barge on its trip to MSFC at Huntsville for static testing.²⁰

- NASA deemed the S-II-6 forward bulkhead as not flightworthy due to excessive corrosion pitting and directed NAA, S&ID, to use the S-II-8 forward bulkhead for S-II-6.²¹

January 19: Following completion of final checkout activities, the S-IVB-207 was placed in storage to await shipment to KSC, scheduled for July.²²

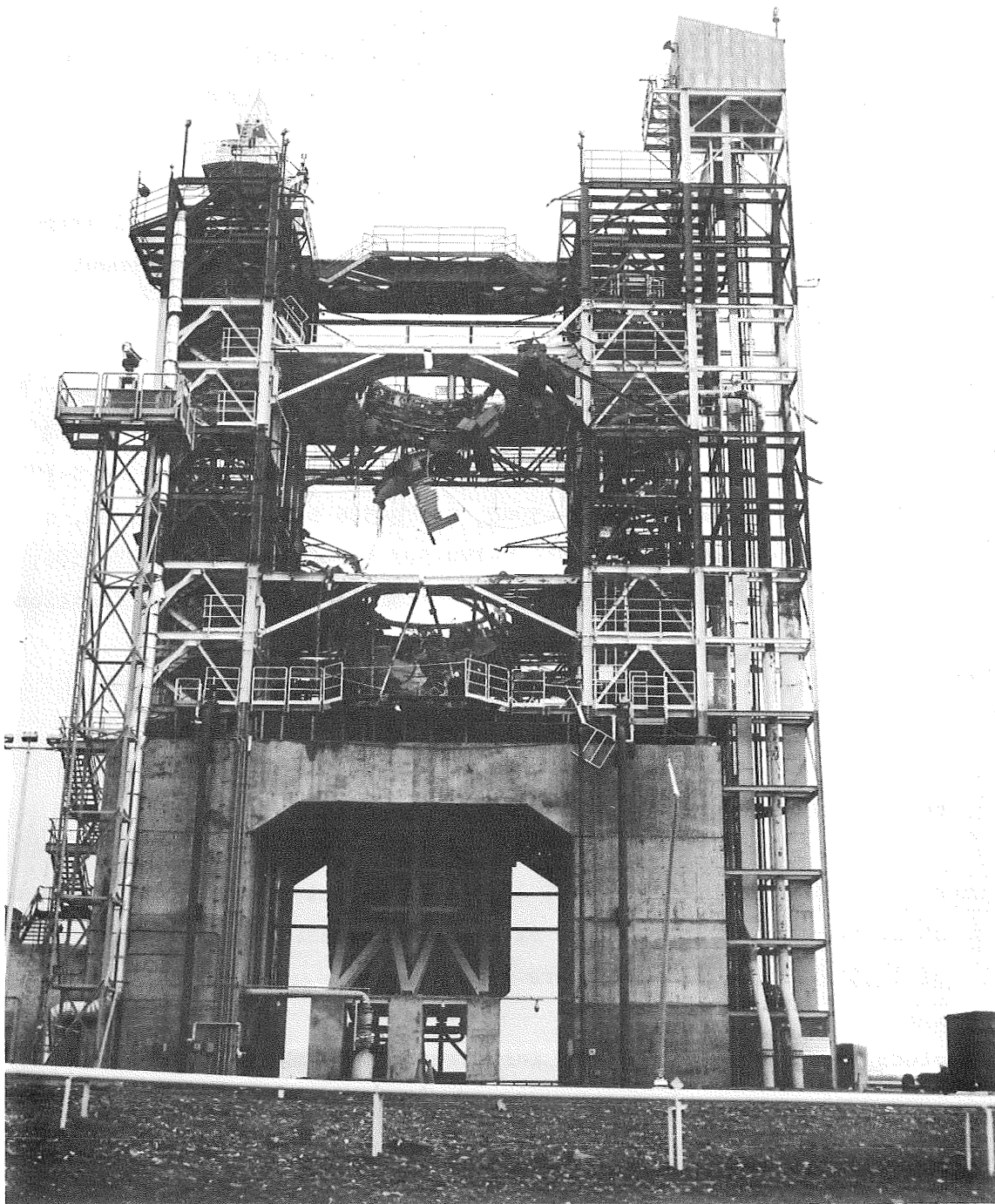
January 20: The terminal countdown for acceptance testing S-IVB-503 was begun in the Beta III Stand at SACTO. This countdown aborted approximately 150 seconds after simulated liftoff due to trouble with the computer tape transport caused by dirt on the tape readout head. Technicians corrected this and recycled the test. Eleven seconds before simulated liftoff again was reached, with all systems showing nominal operation, the stage exploded, completely destroying itself and severely damaging the test stand. Preliminary investigation revealed that one of the eight ambient temperature helium storage spheres located on the engine thrust structure exploded due to weld weakness caused from use of the wrong weld material.²³

- The S-II-1 stage ended its five-day journey aboard the NASA barge Poseidon from MTF to KSC. S-II Project Officials shipped the stage to Cape Kennedy before final post-static checkout and modification in order to eliminate duplicate checkout at MTF and KSC. The officials hoped by this action to save NASA seven to eight days in the Apollo Saturn 501 launch vehicle erection schedule in the VAB.²⁴
- MSFC Manufacturing Engineering (ME) Laboratory personnel completed the S-IC Test Stand Adapter Ring, a device to adapt the S-IC Static Test Stand to receive stages other than the S-IC. The ring, consisting of approximately 90,000 pounds of welded stainless steel, was 33 feet in diameter and 6 feet in height.²⁵
- MSFC awarded a \$100,000 six-month contract to Bell Aerosystems Company for flight testing Bell's "pogo stick" one-man flying vehicle at Langley Research Center's (LaRC's) gravity test facility. The vehicle would be evaluated for possible use in an Apollo lunar surface mission.²⁶



S-IVB-503 FAILS IN ACCEPTANCE TEST

This view of the top deck of the Beta III Stand reveals the complete destruction of the S-IVB-503 stage which exploded during the final seconds of terminal countdown preceding acceptance test.



STAND NEEDS REPAIR

The Beta III Test Stand at Sacramento Field Test Center suffered severe damage as a result of the explosion of the S-IVB-503.

January 23: The S-IVB-206 stage was transported to Launch Complex 37 (LC-37) and erected atop the S-IB-6 stage.²⁷

January 24: The S-II-5 aft LOX bulkhead was successfully hydrostatically tested following repair of 53 doublers which had leaked during tests on January 13.²⁸

January 25: NAA, S&ID, completed all modifications to the S-II-2 stage following factory checkout and moved the stage into Development Station VII for final painting and packaging operations.²⁹

- Following the loss of the S-IVB-503 stage during testing on January 20, NASA officials amended identification numbers of subsequent S-IVB stages to fill the vacancy created. The S-IVB-504 became the S-IVB-503N, S-IVB-505 became S-IVB-504N, S-IVB-506 became S-IVB-505N, a replacement stage using an old S-IVB-507 tankage became S-IVB-506, and S-IVB-507 and subsequent stages retained the old identification.³⁰
- The S-IVB-503N stage, a replacement for the destroyed S-IVB-503, arrived at SACTO from DAC's Space Systems Center. It arrived approximately one week later than scheduled due to engine difficulties in the Super Guppy aircraft.³¹

January 26: NAA, S&ID, replaced S-II-5 cylinders 1-2--made 0.5 inches too short from the cutting apart of the J-weld during the last quarter of 1966--with S-II-6 cylinders 1-2.³²

- Factory checkout of S-IVB-209, initiated on November 28, 1966, was completed.³³
- The S-II-1 LH₂ tank inspection completed as part of the post-static inspection at KSC, revealed no major repair problems.³⁴

January 26: The S-IB-9 stage arrived at the MSFC dock where it was unloaded, moved to the test site, and installed in the Static Test Tower East (STTE) for test.³⁵

- In an Apollo Applications (AA) briefing held at NASA Headquarters, Dr. George E. Mueller, Associate Administrator for Manned Space Flight, presented the most detailed statement to date on the program. He said plans were to form an "embryonic space station" in 1968-69 by clustering four AA payloads launched with Up-rated Saturn I boosters. First mission would be launch of manned spacecraft, followed several days later by launch of spent S-IVB stage converted into a workshop. After the spacecraft had docked, crew would enter workshop through an airlock. They would prepare workshop for storage and return to earth in their spacecraft 28 days later. In three to six months, a second manned capsule would be launched on 56-day mission to deliver re-supply module to workshop and rendezvous with an unmanned Apollo Telescope Mount (ATM), fourth and last launch in the series. Cluster would be joined with multiple docking launched on S-IVB workshop. Emphasizing the importance of manning the ATM, Dr. Mueller said: ".....if there is one thing the scientific community is agreed on, it is that when you want to have a major telescope instrument in space it needs to be manned.

"First of all you need him to point it. Second, you need him to change the films and so on. Thirdly, you need him to maintain it so when something goes wrong he can fix it instead of having to sit on the ground and be frustrated by the fact that some little gadget didn't quite trip when it should have...." Dr. Mueller said principal areas toward which \$454.7 million FY 1968 post-Apollo effort would be directed were "development of extended flight capability, the conduct of manned astronomical and earth observations from space, and continued exploration of the moon."³⁶

January 27: DAC transferred the S-IVB-208 stage from the Beta I Test Stand to the Vertical Checkout Laboratory (VCL) at SACTO for post-firing checkout and all-systems testing.³⁷

- S-IVB-503N was installed in the Beta I Stand at SACTO where modification work began in preparation for its acceptance firing.³⁸
- The S-II-2 stage, transported from NAA, S&ID, to the Navy dock, left Seal Beach, California, aboard the AKD Point Barrow en route to MTF.³⁹
- Checkout of the S-IU-207 was completed by IBM.⁴⁰
- JPL issued request for proposals to industry on contracts for preliminary design and definition studies of an unmanned Voyager landing capsule. Two identical Voyager spacecraft would be launched by a single Saturn V booster in 1973 and in 1975 to conduct scientific studies of Mars and search for extraterrestrial life. From the industrial proposals, due in March, two to four contractors would be chosen.⁴¹
- At KSC a flash fire swept through the Apollo I spacecraft mated to the SA-204 launch vehicle on LC-34. Three astronauts within the capsule, Virgil I. Grissom, Edward H. White, and Roger B. Chaffee, perished from smoke inhalation. The AS-204 launch vehicle remained undamaged.⁴²

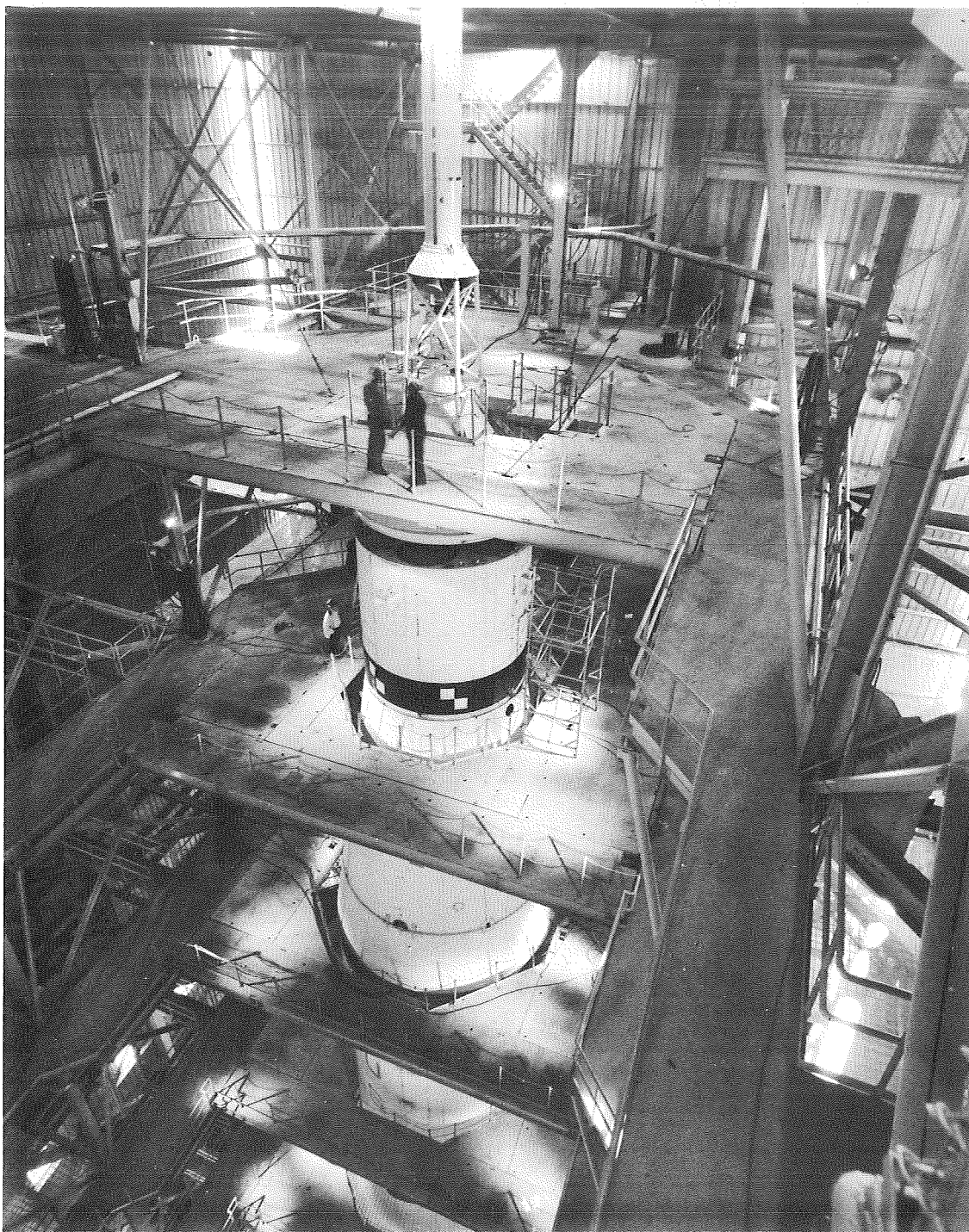
January 28: Deputy Director Robert Seamans of NASA appointed a Board of Inquiry and announced that all data relevant to the AS-204 accident had been impounded pending formal investigation. The board included Dr. Floyd L. Thompson, Director of Langley Research Center (LaRC) as Chairman, Astronaut Frank Borman and Maxime Faget of MSC, E. Barton Geer, LaRC, George Jeffs, NAA, Dr. Frank A. Long, Cornell University, Col. Charles F. Strang, Norton Air Force Base, California, Dr. Robert W. Van Dolah of the Bureau of Mines, Department of Interior, George C. White, Jr., NASA Headquarters, and John Williams, KSC. LaRC Chief Counsel George Mallay would serve as counsel to the board.⁴³

January 31: NAA, S&ID, completed rework of several defects noted during ultrasonic inspection of the S-II-6 common bulkhead earlier in the month. The S-II stage contractor also completed hydrostatic and helium leak testing on the S-II-6 aft bulkhead.⁴⁴

- The S-II-2 interstage arrived at KSC from Seal Beach aboard a commercial freighter. (See Jan. 18 Item.)⁴⁵

In January: Configuration I testing of the SA-500D began at MSFC.⁴⁶

- NAA, S&ID, began assembly and welding of the S-II-7 flight stage.⁴⁷
- DAC completed structural assembly of the S-IVB-504N stage.⁴⁸



READY FOR CONFIGURATION I TESTING

The SA-500D, the Saturn V Dynamic Test Vehicle, is shown in the Dynamic Test Stand at MSFC being readied for Configuration I tests.

FEBRUARY 1967

February 2: IBM transferred the S-IU-207 unit from the checkout stand to the storage facility, and began stand alterations to accommodate systems retest of the S-IU-205 unit in Huntsville.¹

February 3: Boeing completed post-static checkout of S-IC-3 at Michoud.²

- In the first statement concerning Apollo flight missions since the AS-204 accident, NASA Associate Administrator for Manned Space Flight Dr. George E. Mueller announced that NASA would proceed with launching of three unmanned Apollo flights scheduled for 1967: AS-206, AS-501, and AS-502. Manned Apollo missions were postponed indefinitely pending the outcome of the Apollo 204 Review Board's investigation.³
- NASA signed an incentive contract modification with the Boeing Company for five Saturn V S-IC stages, S-IC-511 through S-IC-515. The \$120 million supplemental agreement extended the Boeing contract through June 1970. NASA also authorized Boeing to rehabilitate or replace some 360 assembly tools and pieces of equipment at a cost of \$1,895,195.⁴

February 6: The S-IC-2 stage entered final checkout in the MSFC Quality Laboratory.⁵

- IBM began retest of the S-IU-205 unit at the firm's Checkout Facility in Huntsville.⁶

February 7: DAC completed factory checkout of S-IVB-209 and began preparations for weighing and painting the stage prior to shipping it to SACTO for acceptance testing.⁷

February 8: The S-II-4 stage successfully completed pneumatic testing.

This was the first stage of the lightweight design to be subjected to this test, and was also the first S-II stage to be tested at the higher LOX tank pressure allowing deletion of the stage hydrostatic test requirement.⁸

- Field tests of the Lunar Scientific Survey Module (LSSM) Mobility Test Articles (MTA's) were completed at Yuma Proving Grounds; the MTA's were stored at Yuma pending completion of data reduction at MSFC.⁹

February 10: DAC completed final installations in S-IVB-210 and initiated factory checkout of the stage.¹⁰

February 11: NAA, S&ID, personnel at KSC completed S-II-1 repair and post-static checkout operations and began incorporating a number of modifications deferred from MTF.¹¹

- The S-II-2 stage arrived at MTF from NAA, S&ID, Seal Beach, California. MTF personnel moved the stage from the barge to the vertical checkout position for special inspection of the LH₂ tank.¹²

February 13: Construction of the S-IC B-2 Test Stand was completed at MTF. Also completed was the first phase of the Test Position Demonstration Test, the successful fuel-loading of the S-IC-T, the stand's occupant.¹³

February 14: The Directors of Industrial Operations (IO) and Research and Development Operations (R&DO), the two major organizational segments of MSFC, signed a Program Management Agreement concerning the detailing of Project Management personnel to the Advanced Systems Office of R&DO. The agreement provided an arrangement whereby the philosophies and requirements of program management could be included

in the early phases of projects which ultimately would be managed by IO. This would be achieved by bringing together a cadre of IO and R&DO personnel and assigning them to a project during its early phases in the Advanced Systems Office.¹⁴

February 15: IBM interrupted checkout of the S-IU-503 unit to update the station for retest of the S-IU-502.¹⁵

- The H7-17 fitup fixture, used as a spacer in lieu of the S-II stage, was destacked from the AS-501 vehicle at KSC and shipped to MTF for use in the checkout of the A-1 Test Stand.¹⁶
- CCSD personnel at MAF completed post-static alteration of S-IB-8. This involved correction or resolution of all discrepancies discovered during post-static inspection.¹⁷
- MSFC completed fabrication of the S-IVB/Lunar Module (LM) service platform steps and delivered them to KSC. The steps provided a work platform on the S-IVB stage for work on the LM in the stacked condition at KSC.¹⁸

February 16: NAA, S&ID, workmen at Seal Beach completed welding of the S-II-8 aft facing sheet. It was then reassigned for use on the S-II-TS-A test structure, and the S-II-9 facing sheet gores, redesignated for S-II-8 use, were positioned in the weld structure.¹⁹

February 17: The first full-duration test of a cluster of uprated J-2 engines, S-II Battleship Test No. 041, lasted 360 seconds.²⁰

- Requalification of the SA-204 vehicle following de-erection of the Apollo spacecraft consisted of two tests, the Launch Vehicle (LV) Emergency Detection System test and the LV Systems Plugs-In test; both were accomplished successfully with no problems.²¹

February 18: MTF personnel placed the S-II-2 stage in Test Stand A-2.

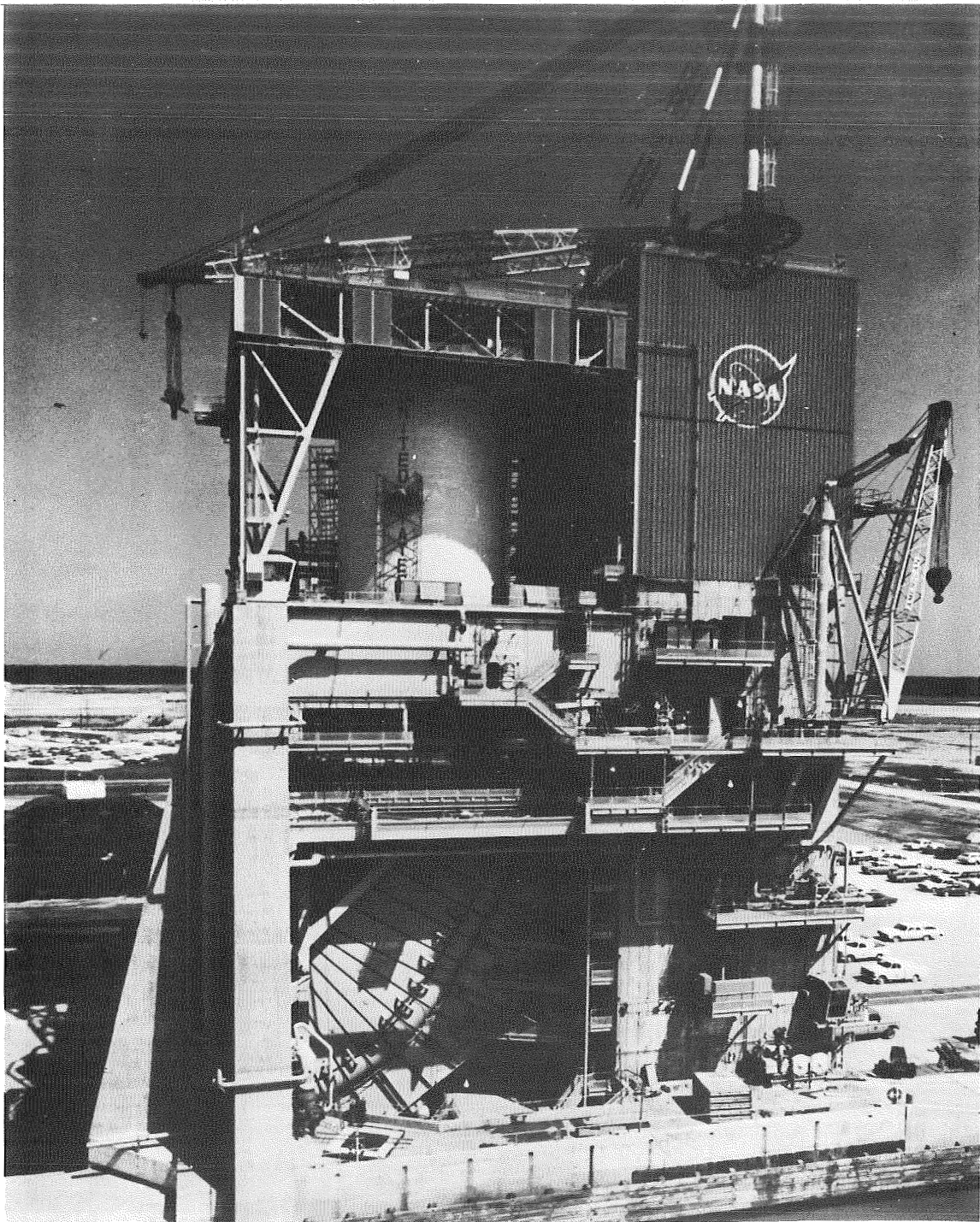
Technicians opened the LOX tank and began an inspection for excessive lubricant prior to initiating modifications and hardware instrumentation installation preceding acceptance testing.²²

February 20: Systems retest of the S-IU-205 unit, interrupted February 7 due to software problems, began again at IBM's Checkout Facility in Huntsville.²³

- Technicians completed final installations in the S-IVB-505 stage and began stage checkout.²⁴
- Mr. H. K. Weidner, Director, R&DO, appointed Frederick E. Vreuls to the position of Deputy Director, Technical Systems Office (TSO). Mr. Vreuls would work on specific assignments delegated by the Director, TSO, and also serve as Acting Director of TSO in the absence of the Director.²⁵

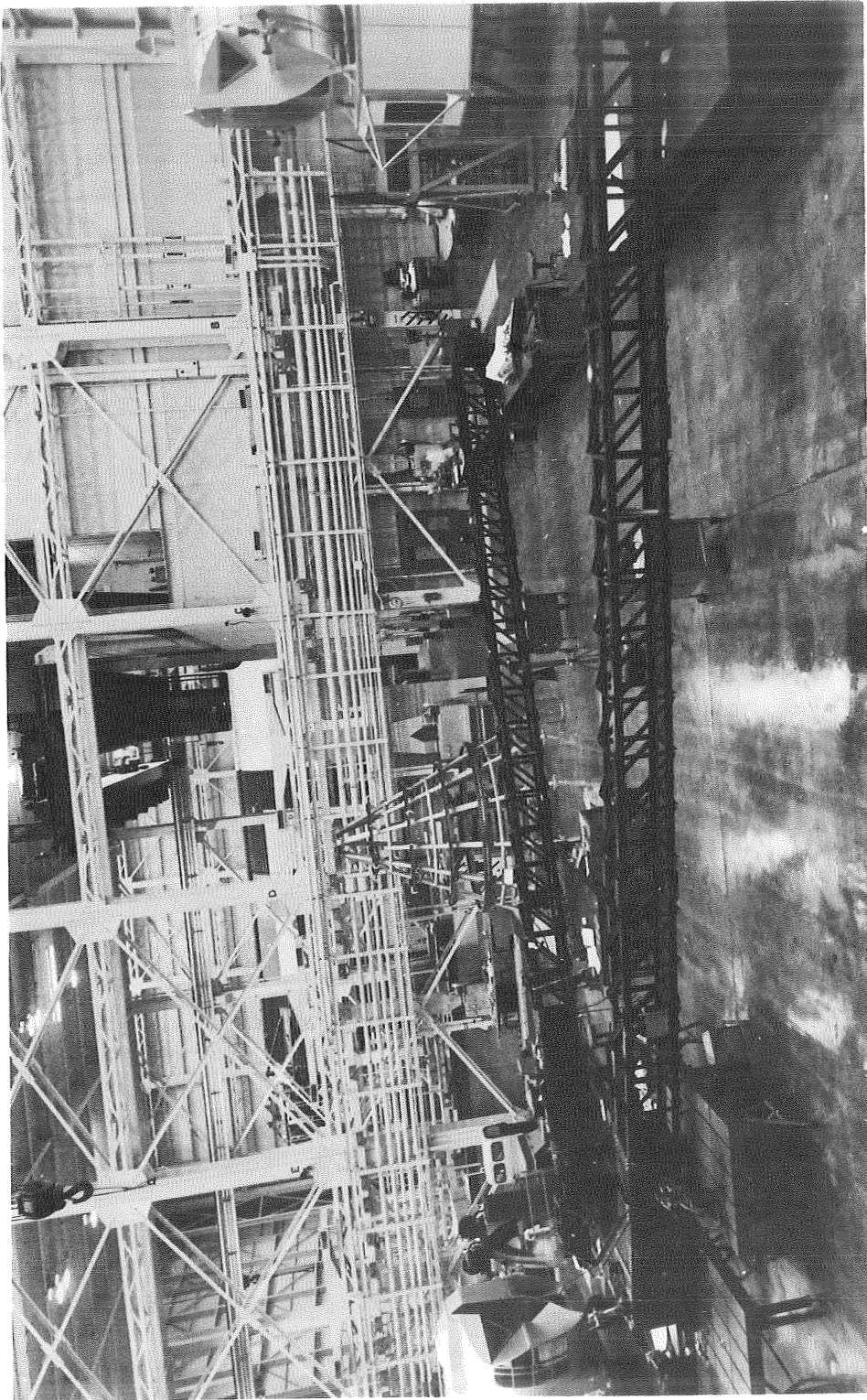
February 21: S-IC-2 returned from the Quality and Reliability Assurance Laboratory to the ME Laboratory following rerun of certain system tests necessary to complete post-static checkout. The tests became necessary following major rework of the stage distributors during post-static modification. ME personnel began preparations for shipping the stage to KSC.²⁶

- DAC completed final modifications on S-IVB-502 including: LOX tank sump screen inspection, low pressure duct reinstallation, and installation of 12 temperature patches in the LH₂ tank to provide additional data required for more accurate boiloff predictions. The contractor then deemed the stage "ready for shipment," and shipped it to KSC onboard the Super Guppy aircraft.²⁷



S-II-2 STAGE IN STAND

The S-II-2 stage, positioned in Test Stand A-2 at MTF, is ready for inspection and modifications prior to acceptance tests scheduled to occur in March.



SATURN V DAMPER SYSTEM IN ASSEMBLY

Shown in fabrication and assembly at MSFC are a set of adapter arms which form the Saturn V Damper System. The Damper System helps to restrain movement of the vehicle within safe limits during critical and steady state ground winds exceeding vehicle design conditions while the vehicle is exposed on the Mobile Launcher.

February 21: IBM completed structural fabrication of S-IU-209 and moved the unit to the assembly stand.²⁸

February 22: The S-IVB-502 stage arrived at KSC and was moved temporarily to Hangar AF.²⁹

February 23: IBM began retest of the S-IU-502 following station validation of the checkout stand.³⁰

February 24: On completion of a series of simulation flight tests and a propellant loading test, the S-IB-9 underwent its initial short duration static firing. An erroneous cutoff resulting from a circuit breaker dropout in a computer stopped the firing after only 13.528 seconds.³¹

- MSFC shipped the first Saturn V damper assembly from Huntsville to KSC to support the AS-501 mobile launch operations.³²

February 25: The S-IVB-502 stage was moved into the VAB at KSC to undergo receiving inspection.³³

- Construction of the S-II A-1 Test Stand at MTF was completed and the Corps of Engineers accepted beneficial occupancy with exceptions.³⁴

- The first mating of the entire SA-501 vehicle in the VAB at KSC ended with erection of the S-IU-501 atop the S-IVB stage. The mating process had involved joining of the S-II-1 to the S-IC-1 and the S-IVB-501 to the S-II stage on February 23 and 24.³⁵

February 27: The S-IB-9 stage accomplished all of the planned short-duration test objectives in a second firing lasting 35.44 seconds.³⁶

February 27: The S-II-3 stage entered systems checkout at NAA, S&ID; remaining manufacturing effort would be accomplished on a noninterference basis.³⁷

In February: DAC completed J-2 engine installation in S-IVB-504N and initiated stage checkout.³⁸

- NAA, the S-II stage prime contractor, gained beneficial occupancy of three newly constructed buildings at its Seal Beach Complex. Departmental moves into the new Station I Subassembly Building began February 3, into the Multipurpose Building 81 on February 10, and into the Warehouse and Maintenance Building 86 on February 24. Overall construction of the eight-story Administrative Office Building No. 80 progressed on schedule through February.³⁹

MARCH 1967

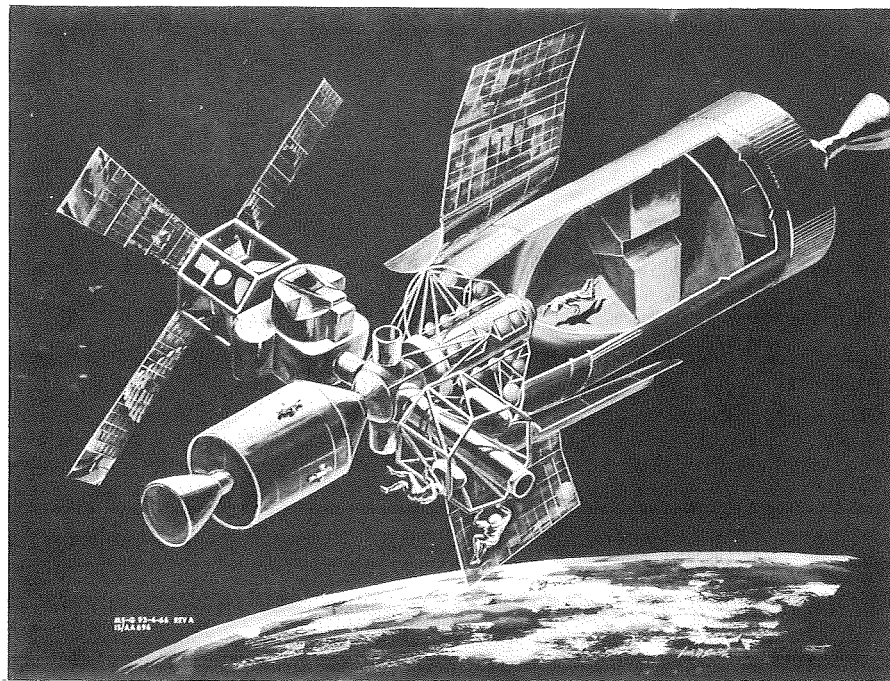
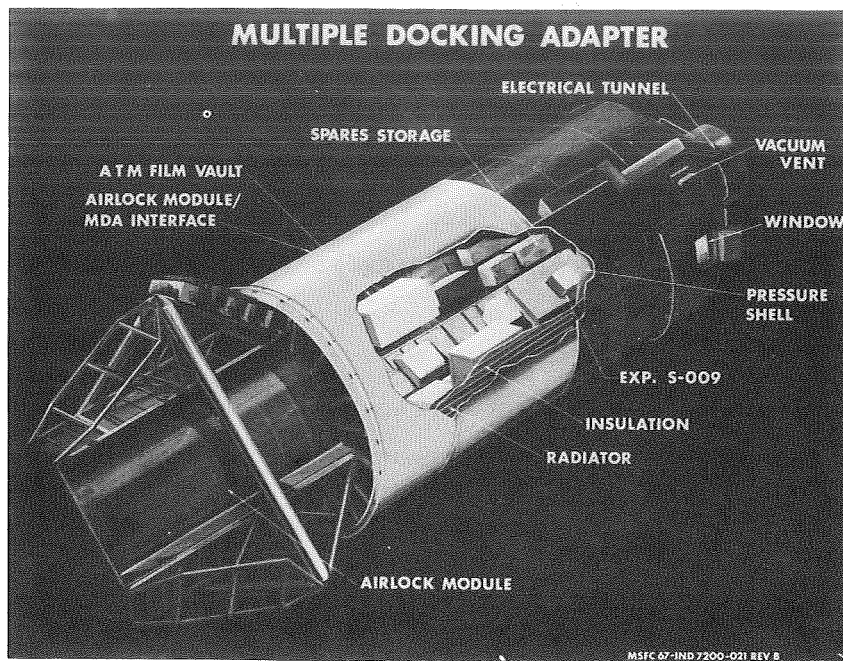
March 1: MSFC personnel demonstrated to NAA, S&ID the use of mechanized spray foaming equipment especially developed and adapted to replace the present S-II stage insulation with spray foam. Spray foam insulation offered the following advantages: weight reduction and easier handling with equal performance.¹

March 2: The first Uprated Saturn I nosecone, Nosecone No. 1, for use on SA-206, left MSFC aboard the Pregnant Guppy aircraft bound for KSC.²

- The Director of the Advanced Systems Office, MSFC, announced formation of a task group to assist in coordination of R&DO efforts and to support Voyager Project definition and initiation. The task group, headed by L. T. Spears and including W. Y. Jordan as Deputy, with G. Woodcock, W. Rutledge, J. A. Belew, and G. Turner, would function as the Staff Office for the Voyager Project until further notice.³
- NASA announced MSFC would design and build in-house a multiple docking adapter (MDA) for use in an AA payload cluster scheduled for launch in 1968-69. (See January 26 entry.) Preliminary designs called for a 10-foot-diameter, 15-foot-long cylinder surrounded by five 36-inch-diameter tunnels with docking collars and sealing hatches for orbital docking.⁴

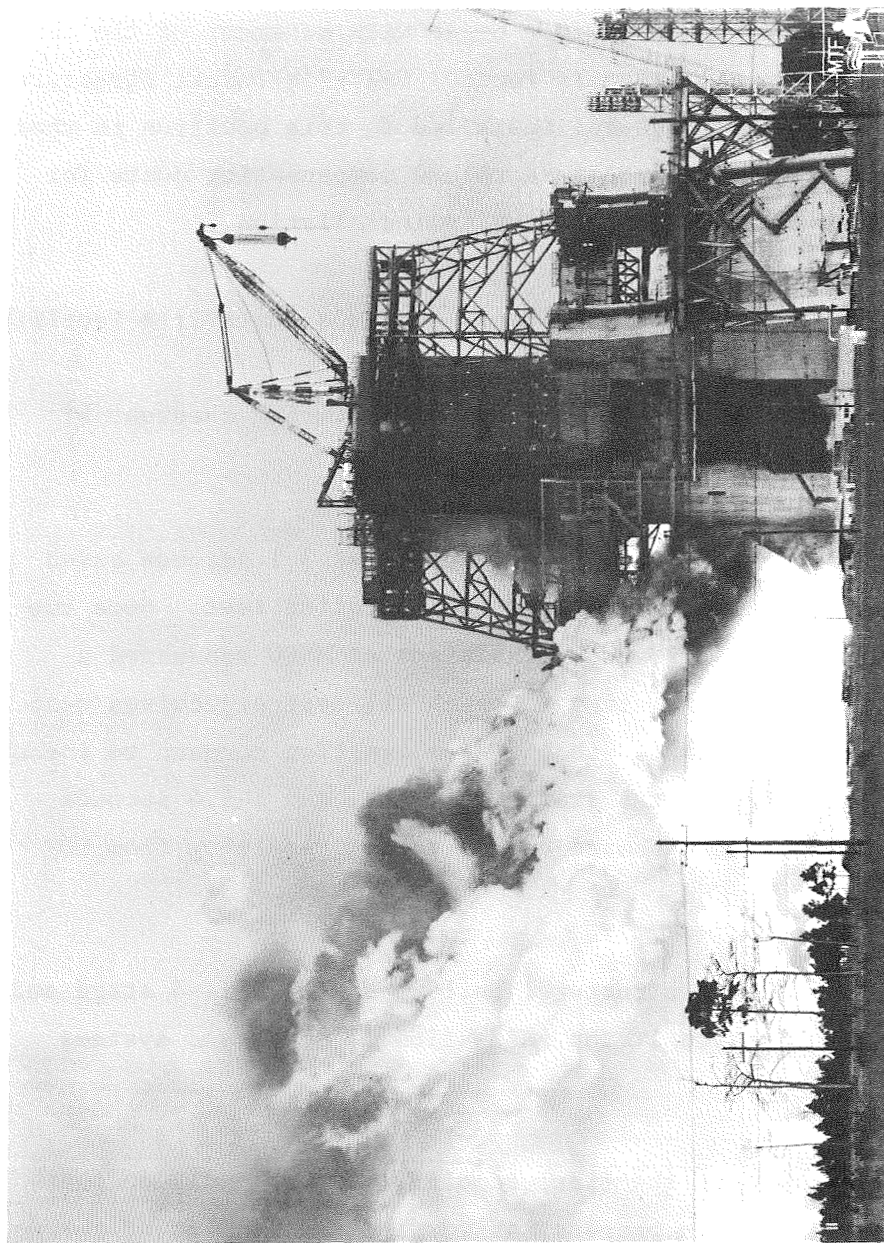
March 3: The S-IC Battleship/All Systems stage (S-IC-T) performed successfully in the first Systems Demonstration Test Firing in the B-2 Test Stand at MTF. The 15-second firing demonstrated the operational capability of the test facility.⁵

- The S-IC-2 stage was shipped via barge from MSFC to KSC.⁶



MULTIPLE DOCKING ADAPTER CONCEPT

The top drawing shows a concept of the multiple docking adapter (MDA) to be designed and built by MSFC. The lower drawing is of a planned Apollo Applications cluster of payloads joined together by the MDA.



B-2 TEST STAND BECOMES OPERATIONAL

Torrents of flame and smoke pour from deflector of high test stand as the S-IC-T, test model of the first stage of Saturn V, undergoes static firing at MTF. The test served to check out the new 407-foot-high test stand and supporting systems which will be used to prove flight-worthiness of S-IC flight stages before they become components of launch vehicles in Project Apollo.

March 4: The S-II-2 stage pre-static and GSE checkout were initiated at MTF.⁷

March 6: Vertical assembly of the S-IC-7 began with movement of the thrust structure to the vertical assembly tower. S-IC-7's thrust structure differed from previous structures installed in this position in that it contained pre valves, the pressure volume compensating ducts for the five F-1 engines, and tubing prior to installation.⁸

March 7: Assembly of the S-IU-209 unit began at IBM's Huntsville Facility.⁹

- A simulated static-firing test ended post-manufacturing checkout of the S-IC-5 stage by Boeing.¹⁰
- An erroneous Beckman Digital Data System cutoff at 3.1 seconds ended the first attempt to fire S-IB-9 in a long-duration test. Some two-and-a-half hours later, however, technicians at MSFC conducted a long-duration firing of the stage in which all test objectives were achieved. S-IB-9 fired 142.4 seconds from ignition command to inboard engine cutoff initiated by the switch selector, and 145.4 seconds from ignition command to outboard engine cutoff resulting from LOX depletion.¹¹

March 8: NAA, S&ID, completed structural buildup of the S-II-4 stage and moved the stage to Station IV for insulation closeout and systems installation.¹²

March 9: NAA, S&ID, completed the final bonding and cure cycle on the S-II-8 forward bulkhead in preparation for its use as part of the S-II-6 stage. (See January 19.)¹³

March 9: DAC airlifted S-IVB-209 from Huntington Beach to SACTO to undergo acceptance firing.¹⁴

March 10: MSFC test personnel installed the S-IC-S fuel tank in the S-IC Test Stand and began preparations for completing a series of hydrostatic pressure tests. The test data would be used by Boeing for tank design evaluation.¹⁵

- The H7-17 fitup fixture returned to KSC from MTF. It would be used in lieu of the S-II stage during stacking of the AS-502 vehicle until the S-II-2 flight stage became available.¹⁶
- Systems retest of S-IU-205 was completed by IBM and preparations began for storage of the unit pending shipment to KSC, rescheduled to occur in July.¹⁷
- IBM completed retest of the second Saturn V Instrument Unit (S-IU-502), necessary because of the incorporation of a number of modification kits. Preparations for shipment of this unit to KSC began immediately.¹⁸

March 11: SA-500D Configuration I testing concluded with a special test to verify the flight control system. The Configuration I test program included roll testing completed January 16, pitch testing completed January 23, yaw testing completed February 15, and longitudinal testing completed February 26.¹⁹

March 13: The S-IC-2 which left MSFC aboard the barge Poseidon on March 3, arrived at KSC. The stage was unloaded and moved into the VAB for receiving inspection prior to being erected on the Launch Umbilical Tower (LUT) #2.²⁰

March 14: Workmen removed S-IB-9 from the STTE at MSFC and loaded it onboard the barge Palaemon for return to MAF.²¹

March 15: Boeing completed post-static inspection and initial modification of the S-IC-3 stage, prepared it for storage, and turned it over to NASA.²²

March 16: S-IVB-208 post-firing checkout ended and DAC placed the stage in storage to await shipment to KSC.²³

March 17: The second S-IC-T firing lasted 60 seconds. This firing validated the flame bucket water flow pattern of the B-2 test stand and ended the facilities checkout test series at MTF.²⁴

- Technicians at KSC erected the S-IC-2 stage on LUT #2 in the VAB to begin the buildup and checkout of the AS-502 vehicle.²⁵
- The S-II Battleship stage was fired for a mainstage duration of 29 seconds (Test No. 42). A gas generator over temperature indication on Engine No. 2 initiated automatic cutoff. Tested on the stage was a 2.5 seconds time delay incorporated in the No. 5 LOX prevalve closing circuit. The time delay would prevent an interference problem between the LOX prevalve relief in the No. 5 feed duct and the thrust cone cruciform occurring during flight acceleration.²⁶

March 18: The S-IB-9 stage arrived at Michoud from MSFC to undergo post-static modification.²⁷

March 20: MSFC personnel at the Redstone airport successfully loaded S-IU-502 in the Super Guppy aircraft after a delay of four days due to high winds. The aircraft carried its cargo to KSC.²⁸

- NASA scheduled use of the AS-204 booster to launch the first Apollo LM on an unmanned flight in the summer of 1967 since it was the last booster equipped with full R&D instrumentation. Original plans had been to use the AS-206 booster. However, the AS-204 launch vehicle,

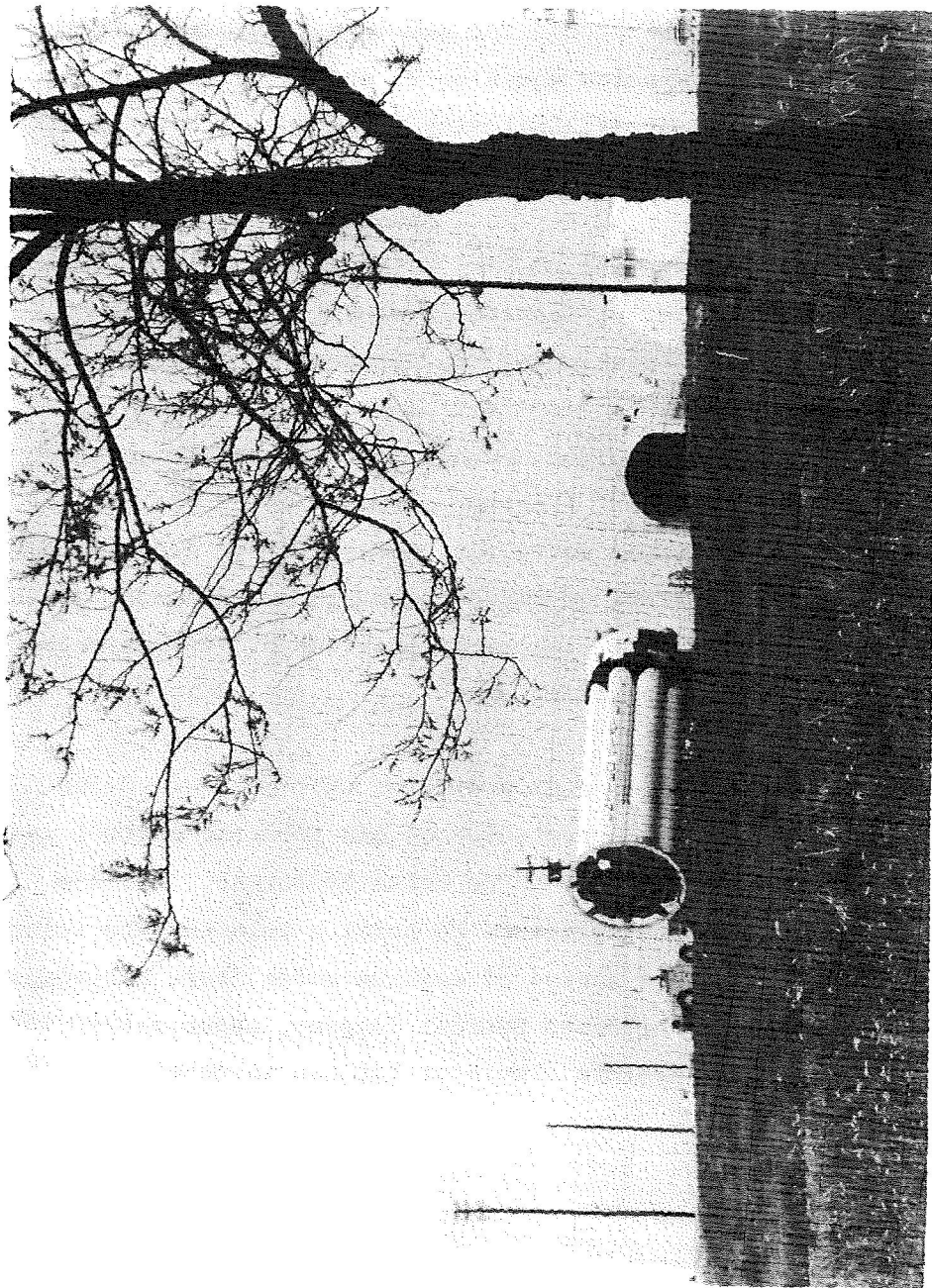
undamaged during the January 27 fire, would be moved from LC-34 to LC-37, a stand already equipped for unmanned launches of the LM. The AS-206 booster would be stored for use in a subsequent mission. Purpose of the first LM mission would be to obtain data on ascent and descent propulsion systems, including a restart of the descent system; verify LM structure; and evaluate staging.²⁹

March 20: MSFC announced assignment of Karl Heimborg, Director, Test Laboratory, as Acting Director of Test and Evaluation at MTF for an indefinite period. In this assignment Mr. Heimborg would be the principal member of MTF management for test plans and procedures, for operation of test facilities, for overall test safety and success, and for NASA direction of test programs carried out by the on-site contractors. This assignment would not change current assignments or the organization structure at MTF even though Mr. Heimborg would have MTF personnel and a small augmentation group of his own selection from the MSFC Laboratory assisting him.³⁰

- MSFC awarded Bendix Corporation a \$7.4 million cost-plus-award-fee contract for development and production of ATM pointing control system (PCS). Bendix would produce three units by August. The ATM system would permit Apollo astronauts to point a telescope to selected regions of the sun during a period of maximum solar flare activities beginning in late 1968. American Optical Company, under a \$740,460 contract, would build a dynamic simulator for use in developing the PCS.³¹

- The S-IB-9 stage, barged from MSFC to MAE, was unloaded and moved to the VAB for post-static modification.³²

March 21: NASA directed MSFC to prepare Boilerplate Spacecraft (BP-30) as a contingency payload for a possible unmanned Saturn V flight.³³



S-IB-9 RETURNS TO MAF

The S-IB-9 was returned to the Michoud Assembly Facility following two successful static test firings at MSFC. The stage is shown here in transport from the barge to the vehicle assembly building.

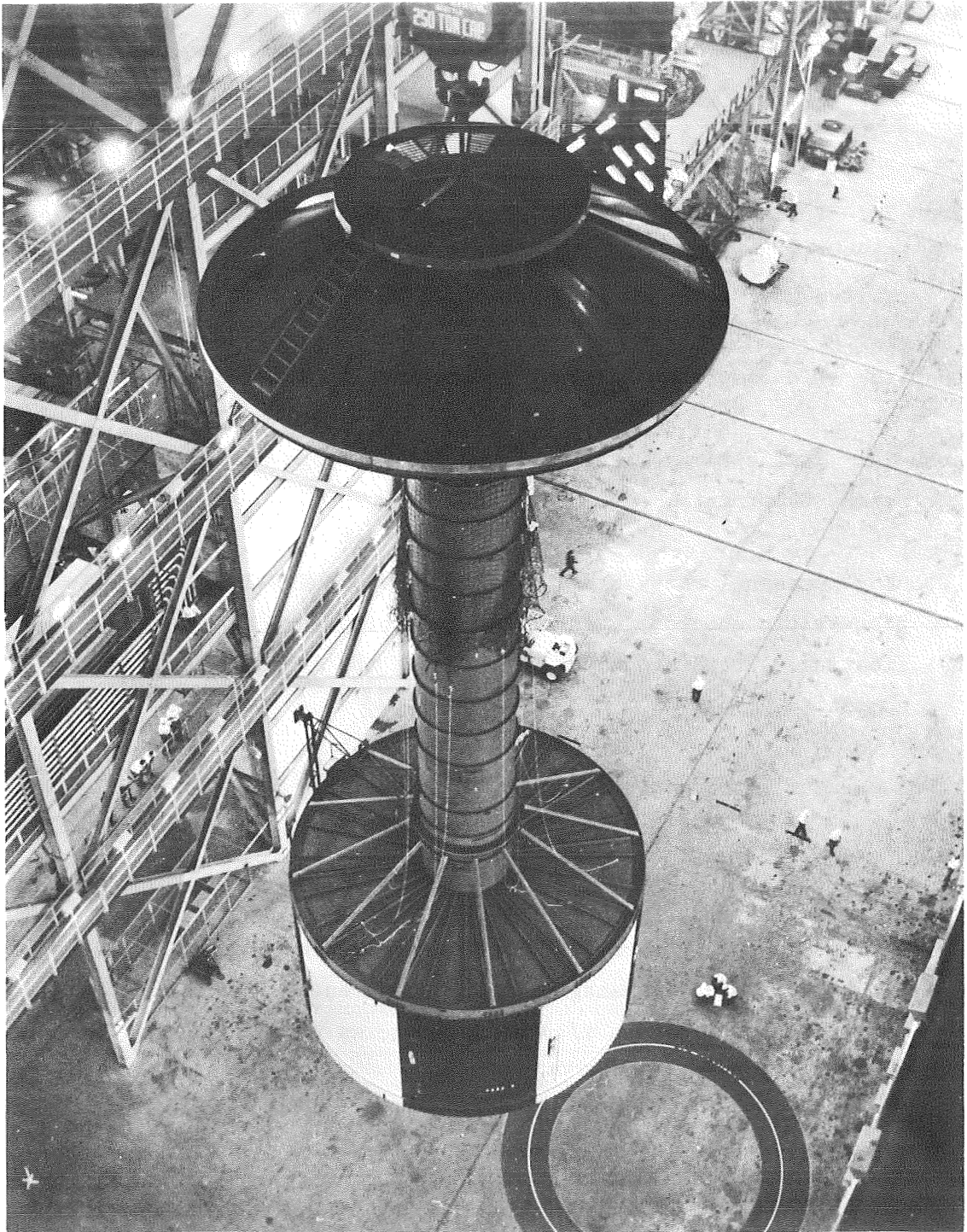
March 21: DAC completed factory checkout of S-IVB-210 initiated on February 10. The stage would be stored at the Space Systems Center until late September due to a higher priority being given stages S-IVB-503N, S-IVB-504N, and S-IVB-505N in use of the SACTO Complex.³⁴

March 22: Buildup of the SA-502 on the LUT #2 continued with erection of the S-II (H7-17) spacer atop the S-IC-2 stage. The S-II-2 stage would replace the spacer on its arrival at KSC.³⁵

March 23: DAC completed internal insulations in the S-IVB-505N stage.³⁶

March 24: Pneumostatic testing of the S-II-5 stage was completed at Seal Beach, California.³⁷

- Boeing personnel removed S-IC-T from Test Stand B-2 at MTF following post-static checkout, test stand refurbishment, and facilities modification. Preparation for shipment of the stage to Huntsville, commenced.³⁸
- Dr. Wernher von Braun, MSFC Director, announced NASA's selection of Lee B. James, Manager of the Saturn I/IB Program, to serve as NASA's Deputy Program Director of the Apollo Program, Office of Manned Space Flight. Dr. von Braun also announced appointment of William Teir, Deputy Manager, Saturn I/IB Operations, to replace Mr. James as Saturn I/IB Program Manager, and appointment of William F. LaHatte, Deputy Manager, Saturn I/IB Management, as the new Deputy Manager, Saturn I/IB Program.³⁹
- IBM completed structural assembly of S-IU-208 and moved the unit to the checkout stand.⁴⁰



H7-17 FIT-UP FIXTURE

The H7-17 fit-up fixture is being erected atop the S-IC-2 stage in the VAB at KSC as a spacer in lieu of the S-II stage.

March 27: Welding and acceptance of the S-II-9 aft and forward facing sheets for use on S-II-8 was made in lieu of the S-II-8 sheets diverted to a test structure.⁴¹

- The S-IVB-209 stage was installed in the VCL Tower No. 1 at SACTO. Stage modifications and static firing preparations began.⁴²

March 28: NASA placed the S-IC-3 stage in storage in the Manufacturing Building at Michoud to await shipment to KSC. Boeing personnel would complete post-static modifications to the stage during the period of storage.⁴³

- The S-IVB stage was erected atop the H7-17 S-II spacer in the buildup of the AS-502 vehicle on LUT #2.⁴⁴

March 29: Erection of the S-IU-502 on the S-IVB stage completed initial buildup of the second Saturn V flight vehicle. The VAB high bay qualification testing on the vehicle continued.⁴⁵

March 30: Vertical assembly of the major S-IC-7 stage components ended in MAF VAB with assembly of the forward skirt.⁴⁶

- Prefiring tests and checkout of the S-II-2 were completed in preparation for the static firing scheduled the following day.⁴⁷

- The S-IU-206 arrived at MSFC from KSC via the Super Guppy. The unit would enter storage at IBM pending reschedule of the SA-206 launch.⁴⁸

March 31: Failure of the No. 1 pre valve to close at T-8 minutes caused program officials to scrub the first attempt to static fire the S-II-2 stage. Continuing the countdown to T-0 to determine if additional problems existed disclosed an intermittent check valve which prevented chilldown of Engine No. 3.⁴⁹

March 31: The S-IC-T was transported from MTF to MAF aboard the barge Pearl River. At Michoud dockhands transferred the stage aboard the covered barge Poseidon for shipment to MSFC in Huntsville.⁵⁰

- NAA, S&ID, successfully completed an integrated systems evaluation run of the S-II-3 stage at Seal Beach.⁵¹
- Workmen at KSC loaded the S-IB-6 stage on the barge Promise, for shipment to Michoud.⁵²
- Assembly of the S-II-8 stage thrust structure began at Seal Beach.⁵³
- Battleship testing of the S-II Battleship test stage equipped with five uprated J-2 engines ended with Test 043, a full-duration test of approximately 360 seconds mainstage operation. Other tests in the series included a transition firing test 040 on February 8, a full-duration firing test 041 on February 17, and an attempted full-duration test 042, cut off automatically after 20 seconds of mainstage operation on March 17.⁵⁴

In March: MSFC received NASA authorization to fabricate three special full-scale S-II test structures identified as S-II-TS-A (LOX tank and lower LH₂ tank assembly), S-II-TS-B (upper LH₂ tank and forward skirt assembly), and S-II-TS-C (aft skirt/thrust structure assembly). The units would be used in a test program to verify the integrity of the lightweight structures of the operational S-II stages (S-II-4 and subsequent).⁵⁵

- NASA gave approval to rebuild the Beta III Test Stand at SACTO, severely damaged on January 20.⁵⁶

APRIL 1967

April 1: The S-IB-10 stage, loaded onboard the barge Palaemon the previous day, departed Michoud for MSFC.¹

April 3: De-erection of the AS-206 vehicle from LC-37 followed reassignment of the LM-1 mission to the AS-204 vehicle. The S-IB-6 stage departed KSC aboard the Promise barge en route to Michoud. At Michoud, the stage would enter storage.²

- MSFC received the Apollo Boilerplate (BP-30) service and command modules to be modified for use as a backup payload for AS-501 and AS-502 missions. Modification would involve adding ballast and internal supporting structures.³

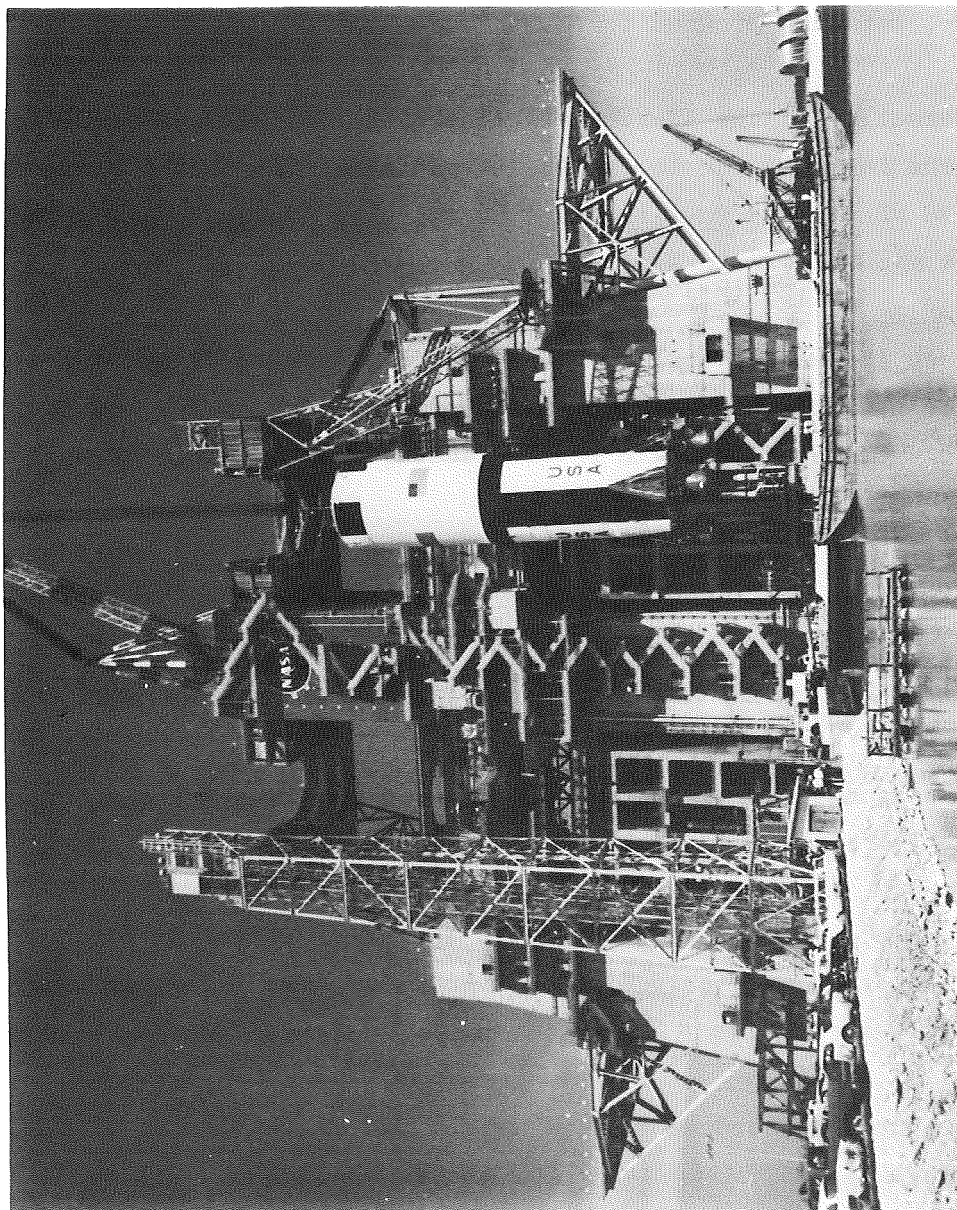
April 4: Technicians removed S-IC-500D from the Dynamic Test Tower and began preparations for shipping the booster, used in Configuration I dynamic tests, to MTF for storage in the Booster Storage Building.⁴

- NAA, S&ID, personnel completed installation of the five J-2 engines in the S-II-4 stage.⁵

April 5: Boeing placed the S-IC-4 stage in the MTF S-IC Static Test Stand. The stage had arrived the previous day from MAF aboard the barge Pearl River.⁶

April 6: MTF personnel conducted a successful 368-second firing of the S-II-2 stage.⁷

- NASA revised designations for Apollo and AA missions: (1) all Apollo missions would be numbered sequentially in the order flown, with the next Apollo mission to be designated Apollo 4, followed by Apollo 5,



S-IC-4 GOES INTO STAND

The first flight version of the Saturn V space booster is shown being installed in the B-2 Test Stand at MTF. The 160-million-horsepower rocket, second of its kind assembled at Michoud Assembly Facility, will undergo static firing in mid-May.

etc.; (2) AA missions would be designated sequentially as AAP-1, AAP-2, etc. Number designations would not differentiate between manned or unmanned Up-rated Saturn I and Saturn V missions.⁸

April 7: The S-IB-6 stage arrived at MAF from KSC for storage pending reschedule of Up-rated Saturn I flights.⁹

- IBM initiated checkout of the S-IU-208 unit.¹⁰

April 9: The S-IB-10 stage, shipped by barge from MAF on April 1, arrived at MSFC's Huntsville dock.¹¹

- The S-IC-T which left Michoud aboard the Poseidon barge on April 1 arrived at MSFC. At MSFC it entered storage in the ME Laboratory to await use in research and development tests.¹²

- NASA disestablished its field activity of the Office of Industry Affairs at Downey, California, and reassigned personnel and the functions formerly performed by the office to MSFC and MSC. MSFC became responsible for complete support of the S-II and other currently assigned MSFC contracts. MSC became responsible for complete support of the Command and Service Module and other currently assigned MSC contracts; certain common functions such as local supply distribution, receiving inspection, divisional burden surveillance, rate negotiations, procedures approval, and annual overhead negotiations; and central administration of new contracts assigned from other NASA Centers or Department of Defense. The two Centers would accomplish the assigned functions through respective Resident Manager Offices at NAA, S&ID, Downey, California.¹³

April 10: CCSD test personnel at MSFC installed S-IB-10 in the STTE and began preparations for testing the stage, the fifth using H-1 engines, capable of producing 205,000 (205K) pounds of thrust each.¹⁴

April 12: DAC technicians completed stage checkout of S-IVB-504N in the Space Systems Center and moved the stage to the Manufacturing Tower 7 for installation of the dual repressurization system.¹⁵

April 13: The S-IVB-206 stage, de-erected from LC-37 following reassignment of the LM-1 mission to the AS-204 vehicle, was shipped from KSC via the Super Guppy aircraft to SACTO where it would be stored.¹⁶

April 14: MSFC's Test Laboratory assumed lead responsibility for long-term storage of Saturn stages and related hardware. The Lab began preparation of a plan to standardize storage requirements and to provide guidance to existing stage and/or engine storage study contracts.¹⁷

- S-IVB-505N tank installations, cleaning, and closing were completed in Tower 4 of the Space Systems Center and the stage moved to Tower 2 for skirt joining and installation.¹⁸

April 15: The S-II-2 stage performed successfully 367 seconds in its second and final acceptance test at MTF.¹⁹

- MSFC completed award of one-year, cost-plus-incentive-award-fee (CPIF) contract extensions totalling more than \$57 million for engineering, fabrication, and institutional support services for the Saturn launch vehicle program. Recipients: Sperry Rand Corporation, \$12,695,727; Vitro Corporation \$5,344,159; Brown Engineering Company, \$12,350,140; Spaco, Incorporated, \$5,971,638; Northrop Corporation, \$3,905,000; Hayes International Corporation, \$4,969,277; Management Services, Incorporated, \$5,560,941; Rust Engineering Company, \$599,090; and RCA Service Company, \$5,749,907.²⁰

April 15: The Lockheed California Company reported results of a study performed for MSFC on the evolution of an earth-to-orbit transportation system that would be able to adapt in an optimum way to an increasing transport volume. Entitled "Reusable Aerospace Passenger Transport: Study of Incremental Development Approaches," the investigation compared alternate routes available for development of a reusable system in an incremental fashion as an extension of presently approved launch vehicles and spacecraft.²¹

April 17: At MAF CCSD personnel completed post-static modification and checkout of the S-IB-8 stage.²²

- NAA, S&ID, completed successfully the automatic integrated systems checkout of the S-II-3 stage.²³

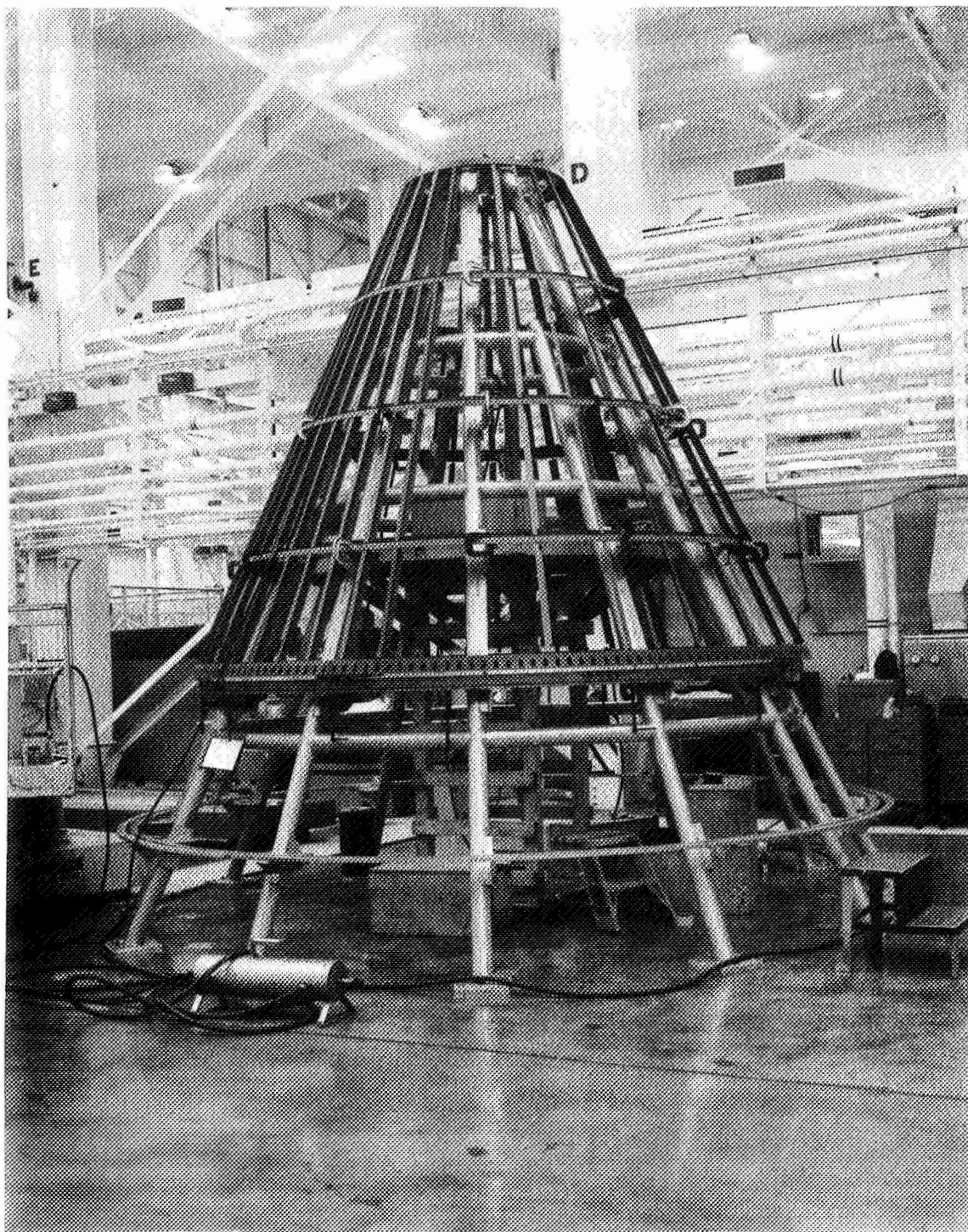
- NAA, S&ID, personnel completed the S-II-5 LH₂ in-tank systems installations and moved the stage to Assembly Station II at Seal Beach for installation of remaining systems and insulation closeout.²⁴

April 18: Structural assembly of the S-II-9 stage began with meridian welding of the aft facing sheet gores.²⁵

April 19: MSFC completed the Uprated Saturn I nose cone No. 2 for use on SA-208 and, due to the realignment of the Uprated Saturn I flight program, placed it in storage instead of shipping it to KSC.²⁶

- The S-IVB-211 stage entered post-manufacturing checkout following stage joining and J-2 engine installation.²⁷

April 20: CCSD moved S-IB-7 into the functional checkout complex for a reverification checkout. NASA requested such a checkout because of the extensive modification to S-IB-7 and due to the slip in the



UPRATED SATURN NOSE CONE NO. 2 IN FABRICATION

Shown in fabrication is the structural framework for the Uprated Saturn I nose cone No. 2. Due to a realignment of the flight program, the nose cone when completed, will be placed in storage rather than shipped to KSC.

shipping date to KSC. During and subsequent to the checkout, additional modifications would be incorporated into the stage configuration. These would include components and assemblies necessary prior to movement of the stage to in-house storage; additional flight items not installed during post-static alterations; and nonflight items, paintings, and cleaning necessary in preparing the stage for in-house storage and for shipment.²⁸

April 20: Vertical assembly of the S-IC-7 stage was completed by Boeing at Michoud.²⁹

- IBM initiated checkout of the S-IU-503 unit.³⁰
- Preparation of BP-30 as a contingency payload for either the first or second unmanned Saturn V flight was assigned top priority at MSFC in order to meet the AS-501 launch schedule.³¹
- As a result of the new emphasis on safety generated by the Apollo capsule accident in January 1967, MSFC management and contractor representatives met at the Center to form the MSFC/Contractor System Safety Network. Simultaneously, the first Technical Interchange meeting was held at which time the representatives discussed technical problems or conditions that could result in unseen failure or loss of life and possible prevention and solutions to such.³²

April 21: Three LSSM MTA's tested at the Yuma Proving Ground arrived at the MSFC/Huntsville Test Laboratory to undergo reassembly and checkout prior to additional tests. Purpose of additional testing is to determine vehicle power requirements and to obtain human factors information.³³

April 23: The S-IC-D stage arrived at MTF from Huntsville, Alabama. Workmen at MTF placed the stage in storage pending its use in the early fall.³⁴

April 24: Fabrication of a quick-release manhole cover was completed by MSFC. This type cover is used in the S-IVB forward bulkhead to provide entry into the orbital workshop.³⁵

April 26: A first attempt to acceptance-fire S-IVB-503N was scrubbed because of erratic operation of the propellant utilization (PU) system. Replacement of the PU system began immediately.³⁶

- Dr. George Bucher, Technical and Scientific Assistant to the Director, Research Projects Laboratory (RPL), was appointed by the R&DO Director to the position of Assistant Director of RPL. In this capacity he would assist in planning and executing the in-house work program, the flight experiment development program, and scientific and technological programs in support of MSFC development projects. He would also assume charge of the Lab in the absence of the Director and the Deputy Director.³⁷

April 27: MSFC completed a review of three previous Saturn IB Improvement studies and confirmed that it would be feasible to increase the payload capability of the Up-rated Saturn I by use of solid rocket motor (SRM) strap-ons or by use of SRM's as the first stage booster. Recommendations for related areas for future investigation included: instrument unit impact and modifications, solid motor thrust vector control evaluation, solid motor handling and transportation, use of a cluster of 156-inch SRM's with the S-IVB, and aerodynamic data analysis and evaluation.³⁸

April 28: S-IB-10's propellant system functioned satisfactorily during its first propellant loading test.³⁹

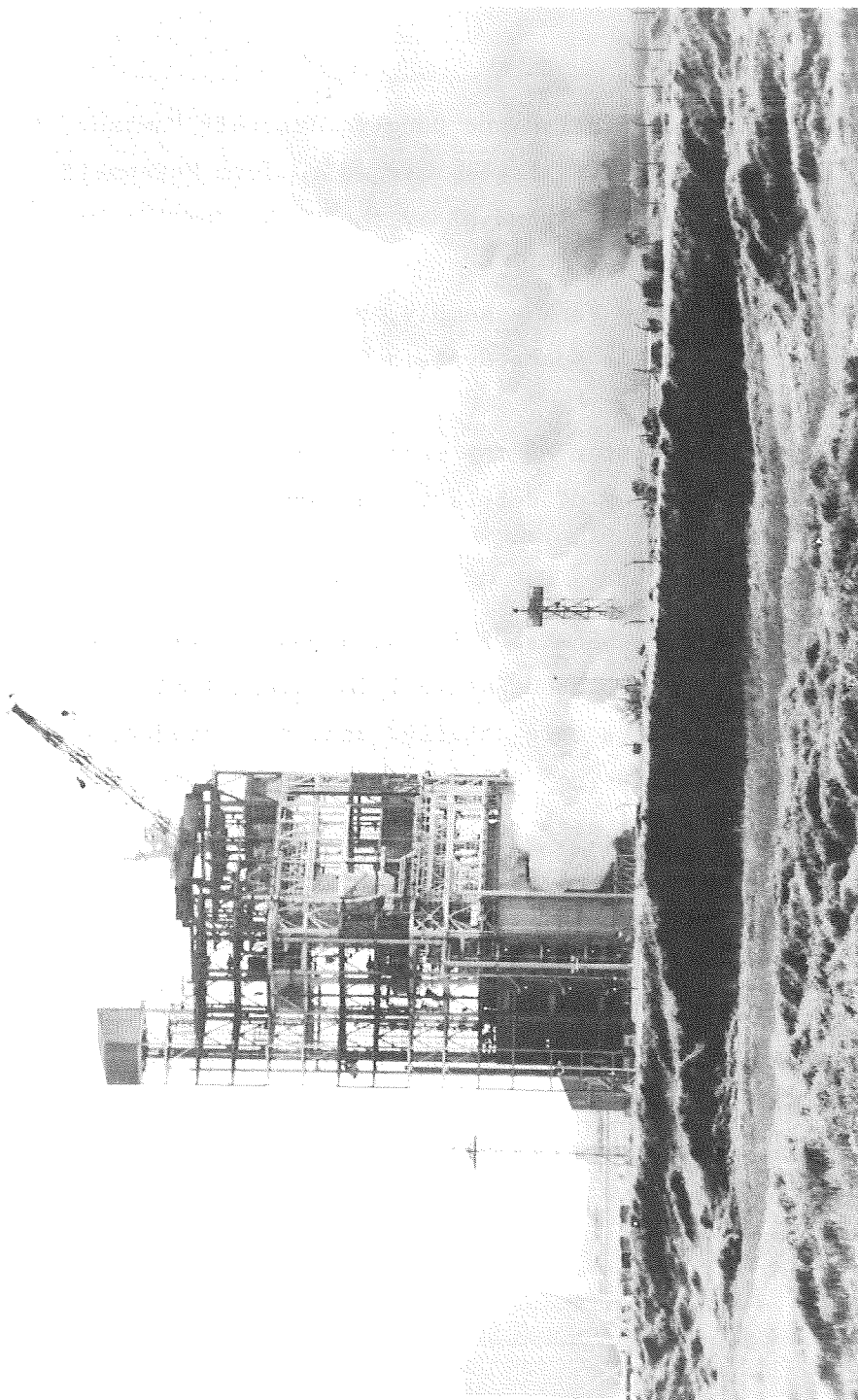
- The S-IC-S fuel tank hydrostatic pressure tests were completed in the S-IC Test Stand at MSFC. Boeing would use the test data in fuel tank design evaluation.⁴⁰

April 29: Hydrostatic tests of the S-II-7 forward bulkhead were completed by NAA, S&ID.⁴¹

- The McDonnell Aircraft Corporation and Douglas Aircraft Company, the contractor for Saturn V S-IVB stages, merged to form McDonnell Douglas Corporation, pending approval by the U. S. Justice Department.⁴²

In April: The S-IVB-506N stage tank assembly, proof testing, and cleaning were completed at DAC's Space Systems Center Tower No. 1.⁴³

- The first phase in reactivation of the Beta III Test Stand at SACTO began; it involved clean up of debris and a comprehensive assessment of damage.⁴⁴
- NASA awarded CCSD Contract NAS8-21107 in the amount of \$113,400 to continue eight months an Up-rated Saturn I Improvement Study. Purpose of the study was to provide more detailed data on a projected Up-rated Saturn I system with a 120-inch SRM having seven and one-third segments. The contractor was also to investigate the option of launching the vehicle with four, two, or no SRM's depending on mission requirements. The study would end in December 1967.⁴⁵
- IBM received Contract NAS8-21076 in the amount of \$222,000 to perform a companion and supporting study to CCSD's Up-rated Saturn I Improvement Study. IBM's effort lasting seven months would involve definition of astronics systems required to implement selected vehicle configurations.⁴⁶



S-IVB-503N SUCCESSFULLY PERFORMS ACCEPTANCE TEST

The S-IVB-503N is shown during an acceptance firing in the Beta I Test Stand at Sacramento. The firing, lasting 446.9 seconds with cutoff initiated by imminent LOX depletion, achieved all planned objectives.

MAY 1967

May 1: CCSD personnel rendered S-IB-8 stage "ready for shipment" to KSC and then prepared it for storage pending a firm shipment date.¹

- NASA personnel completed the initial S-II-3 stage shakedown inspection at NAA, S&ID. Reinspection of the stage electrical networks and the LOX tanks would occur prior to a final systems retest and stage shipment to MTF.²

- The S-II-6 stage pneumostatic testing was completed at Seal Beach.³

May 3: The S-IVB-503N stage successfully performed an acceptance firing of 446.9 seconds, with cutoff initiated by the PU processor due to imminent LOX depletion.⁴

May 8: The S-IC-6 stage entered post-manufacturing checkout in the Michoud Stage Test Building. During the checkout two of the stage engines would be removed, reworked, and reinstalled.⁵

- Technicians at SACTO conducted a 230-second oxygen-hydrogen burner performance verification test and a special LH₂ recirculation pump firing purge test on S-IVB-503N. Satisfactory results were obtained with both tests.⁶

May 9: The S-IB-10 stage performed successfully in a 35.4-second short-duration acceptance firing.⁷

May 10: NASA awarded McDonnell Douglas Corporation a \$4,665,000 modification to an existing contract for reliability and verification testing of Saturn S-IVB stage components.⁸

May 11: Saturn V Configuration II dynamic tests started at MSFC's test complex.⁹

May 12: CCSD completed post-static modification of the S-IB-9 stage and initiated post-static checkout.¹⁰

- At SACTO, McDonnell Douglas Corporation personnel transferred the S-IVB-503N stage from the Beta I Test Stand to the VCL for post-acceptance firing modifications and checkout.¹¹

May 14: The S-IVB-209 stage was transferred from the VCL to the Beta I Test Stand for prefiring checkout.¹²

May 15: MTF personnel completed post-static checkout operations, removed the S-II-2 stage from Test Stand A-2, and began preparations for immediate shipment of the stage to KSC.¹³

May 16: The S-IC-4 stage successfully performed a 125-second duration acceptance firing at MTF.¹⁴

May 17: A combined launch vehicle guidance and control test climaxed the electrical mating and checkout tests on the Saturn 502 vehicle on the LUT #2 at KSC. Following the successful test all stages were powered down for a week of modifications.¹⁵

May 19: At MTF NASA formally declared the S-IC Static Test Stand, B-2 position, and its supporting systems activated and in a formal ceremony turned the stand over to the Boeing Company for use in static firing S-IC stages.¹⁶

May 20: The S-II-2 stage, aboard the barge Poseidon, left MTF en route to KSC.¹⁷

May 20: NAA, S&ID, completed the S-II-TS-C test structure and prepared it for barge shipment from California to MSFC, Huntsville.¹⁸

May 22: The S-IB-10 stage performed successfully during a long-duration acceptance test viewed by Vice President Hubert H. Humphrey. Inboard engine cutoff initiated by the switch selector occurred 142.7 seconds after ignition command; outboard engine cutoff initiated by the backup timer occurred 145.7 seconds following ignition command.¹⁹

- The ML-1 redundant hoist and the ML-2 primary damper system completed qualification testing at MSFC.²⁰

May 23: CCSD personnel completed a reverification checkout of S-IB-7 and began preparations for in-house storage of the stage at MAF.²¹

May 24: The S-II-2 flight stage arrived on dock at KSC. Preparations for low bay checkout commenced, including proof pressure insulation tests and power-on tests.²²

- Meridian welding of the S-II-8 forward bulkhead, begun on April 11, ended.²³

- NASA announced that the S-II-1 stage of the first Saturn V would be dismantled at KSC to check for any "hairline" cracks. This decision was made after similar cracks had been found in an S-II flight stage at NAA's Seal Beach, California, plant.²⁴

May 25: The MSFC Director announced the creation of the MSFC Safety Board to be chairmanned by Erich Neubert, Associate Deputy Director, Technical, and composed of representatives from the various Center elements. The Safety Board would serve as the focus for safety activities of the Center until the advent of a new Safety Office.²⁵

May 26: S-II Battleship transition and full-duration testing during the first half of 1967 ended with the seventh test. Firings included a 1.8-second transition test February 18; the first full-duration test (360 seconds) February 17; four full-duration tests of 355 or more seconds on March 17, March 31, April 26 and May 26; and another transition test of 50 seconds duration May 12.²⁶

- Boeing replaced two F-1 engines in the S-IC-6 stage undergoing post-manufacturing checkout at Michoud.²⁷
- The S-IVB-504N stage underwent painting and final inspection in Building 45 at McDonnell Douglas Corporation's Space Systems Center.²⁸

May 29: Second phase in the reactivation of the Beta III Test Stand at SACTO got underway. This phase, programmed for 13 weeks, involved actual refurbishment of the stand itself.²⁹

In May: McDonnell Douglas personnel completed installation of the J-2 engine in S-IVB-505N, completed hydraulic hookup, and erected the stage in Tower 5 at the Space Systems Center to begin systems checkout.³⁰

- Personnel at McDonnell Douglas Corporation completed the S-IVB-507 tank assembly (joining of the liquid hydrogen tank, liquid oxygen tank and forward dome), and placed the assembly in the Insulation Chamber of the Space Systems Center.³¹
- Relocation of the fabrication stand into a new High Bay at IBM's Huntsville Facility interrupted structural fabrication of S-IU-505 begun earlier in the month.³²

JUNE 1967

June 1: Technicians installed the S-IC-T in the MSFC S-IC Test Stand and began preparations for an approximate 40-second-duration test scheduled to occur in late July.¹

June 2: Having completed the first series of prelaunch checkout tests on the SA-501 vehicle, technicians at KSC destacked it to X-ray and repair imperfections in the propellant tanks of the S-II stage.²

- Dr. Wernher von Braun announced redesignation of the Research Projects Laboratory at MSFC to Space Sciences Laboratory. The new title more "clearly defines the function and more accurately identifies the Lab with the technical and scientific environment of MSFC's R&DO, particularly with respect to the space sciences."³

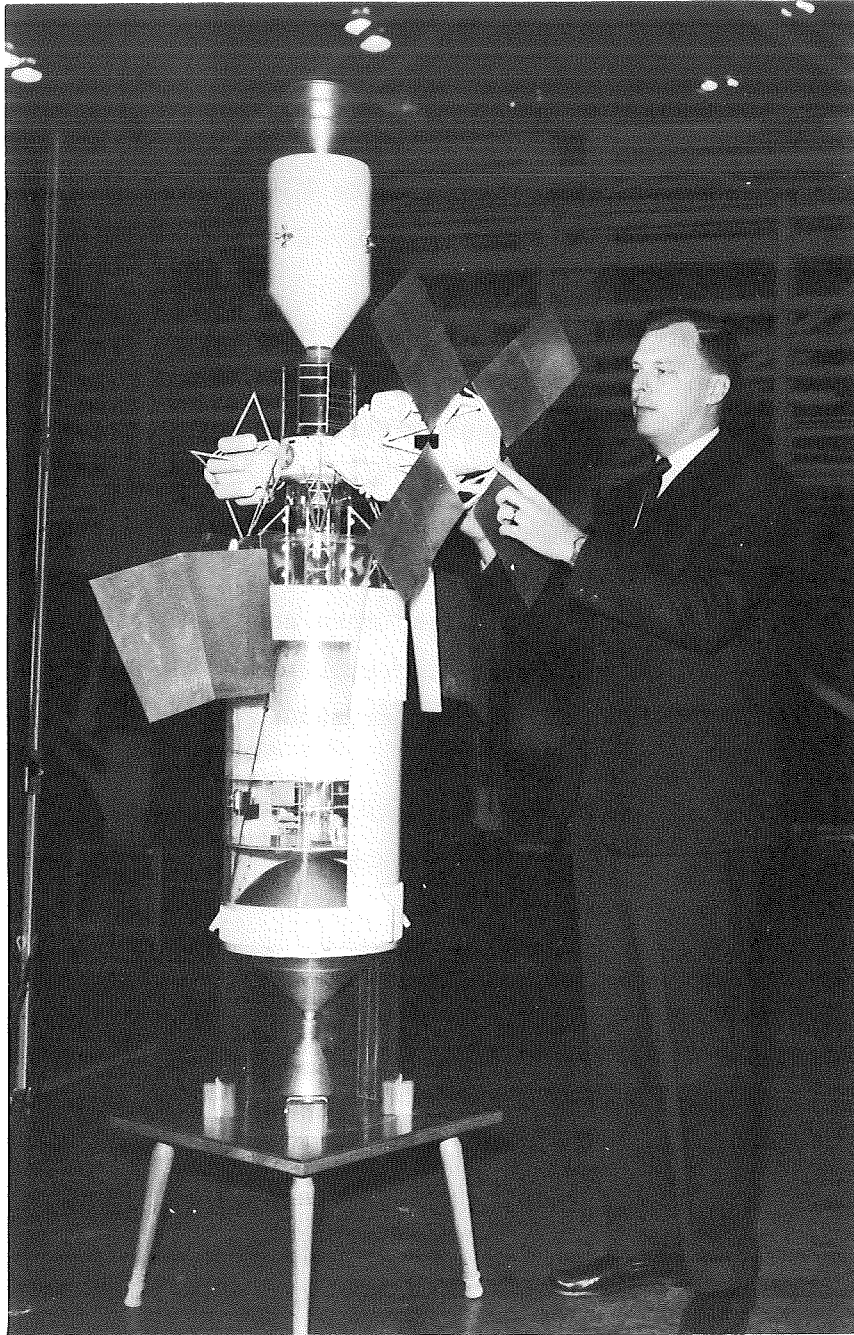
June 6: S-IC-4 returned from MTF to MAF aboard the barge Pearl River. At MAF it entered the Stage Test Building for refurbishment and post-static modification.⁴

- Dr. Wernher von Braun in the Great Hall of the original Smithsonian Building, received the Smithsonian Langley Medal for outstanding contributions to aeronautics and astronautics and a "creative vision of the practical applications of rocket power. . ." He was the thirteenth recipient of the coveted award in its 59-year existence.⁵

- NAA, S&ID, shipped the S-II-TS-C test structure, completed May 20, from Seal Beach to MSFC for use in structural tests verifying the integrity of the lightweight structures of operational S-II stages.⁶

June 7: Workmen removed S-IB-10 from the MSFC static test tower and prepared the stage for return shipment to MAF on June 8.⁷

- IBM completed checkout of the S-IU-208 unit.⁸



ATM PROJECT MANAGER EXAMINES MOCKUP

Rein Ise, Apollo Telescope Mount Project Manager reviews an ATM mockup included in a cluster of Apollo Applications payloads. Large panels on the ATM and the S-IVB workshop depict the solar cell arrays to provide electric power for stays in space of a month initially. Other elements of the cluster are the Apollo spacecraft, top, and the mapping and survey module, left.

June 8: MSFC revised the MAF charter to reflect the name change from "Michoud Operations" to "Michoud Assembly Facility" announced by NASA in July 1965.⁹

June 10: MSFC delivered to the KSC dock the ML-1 redundant hoist and the ML-2 primary damper system.¹⁰

June 13: The S-IB-10 stage arrived at MAF aboard the Palaemon barge from MSFC, Huntsville, where it had undergone acceptance tests.¹¹

- Technicians at KSC completed dye penetrant and X-ray inspection of the S-II-2 stage. (See June 2 entry.) Two small flaws were found and repaired.¹²

June 14: McDonnell Douglas Corporation aborted two attempts to static-fire the S-IVB-209 stage at SACTO. Abort No. 1 occurred due to a false indication from the reusable ignition detect probe; abort No. 2 due to an apparent relay failure, although in post-test investigation it did not repeat the failure.¹³

- Special tests to determine the best way to recover and reuse the Saturn V first stage (S-IC) were being conducted at MSFC. In tests, a one-tenth scale model of the S-IC was dropped from altitudes of up to 156 feet into a 20-foot-deep water tank to simulate descent of the stage through earth's atmosphere and into the ocean. Tests involved a "soft splash" concept designed to bring back the S-IC with a minimum of damage. MSFC engineers said a workable recovery method would save "millions of dollars" in future years.¹⁴

June 15: MSFC's ME Laboratory personnel completed construction of an ATM spar and cannister mockup. (The spar is the large cruciform structure in the center of the ATM which serves as the experiment platform. It is enclosed in a cylindrical assembly called a cannister.)¹⁵

June 16: NASA and Boeing signed a \$20-million letter contract extending the scope of Boeing's work with NASA to include integration of Apollo spacecraft's three modules with the Saturn V launch vehicle. Boeing would: (1) assist and support NASA and its three manned space flight centers--MSC, MSFC, and KSC--in performance of certain technical tasks for Apollo missions AS-501 through AS-515; and (2) be responsible for supporting the Apollo Program Office in integrating the Saturn V booster with the Apollo CM, SM, and LM. Work would be performed under overall direction of NASA's Office of Manned Space Flight, Apollo Program Office. Boeing Company's currently contracted Saturn work included engineering, construction, and testing of the Saturn V S-IC stage; support of assembly and system integration of Saturn V S-II and S-IVB stages with the S-IC; operation of the Saturn V breadboard facility; and design engineering support of certain ground support equipment at KSC.¹⁶

- The S-IVB-504N stage, airlifted to SACTO via the Super Guppy aircraft, was placed in Tower #1 of the VCL for prefiring modifications.¹⁷

June 18: NAA, S&ID, completed rework of weld discrepancies revealed by dye-penetrant tests that followed pneumostatic testing of S-II-6 on May 1 and June 2. The contractor then moved S-II-6 into the VAB for LOX tank inspection.¹⁸

June 20: The S-IVB-209 stage was successfully static-fired for a main-stage duration of 456 seconds in the Beta I Test Stand at SACTO. The firing was terminated by LOX depletion cutoff as planned.¹⁹

- Technicians at KSC completed erection and mating of the spacecraft to the SA-501 launch vehicle which had been restacked and electrically mated in the VAB on June 18 and 19.²⁰

June 21: Following post-manufacturing checkout and modification, the S-IC-5 stage was transported via the Pearl River barge from MAF to MTF for additional changes and static tests.²¹

- The S-IC-8 fuel tank underwent a hydrostatic proof test to determine if cracks in the weld repair areas, discovered during inspection prior to component assembly, would propagate. The test revealed no growth in the cracks nor any leakage and the tank was returned to production for component assembly.²²

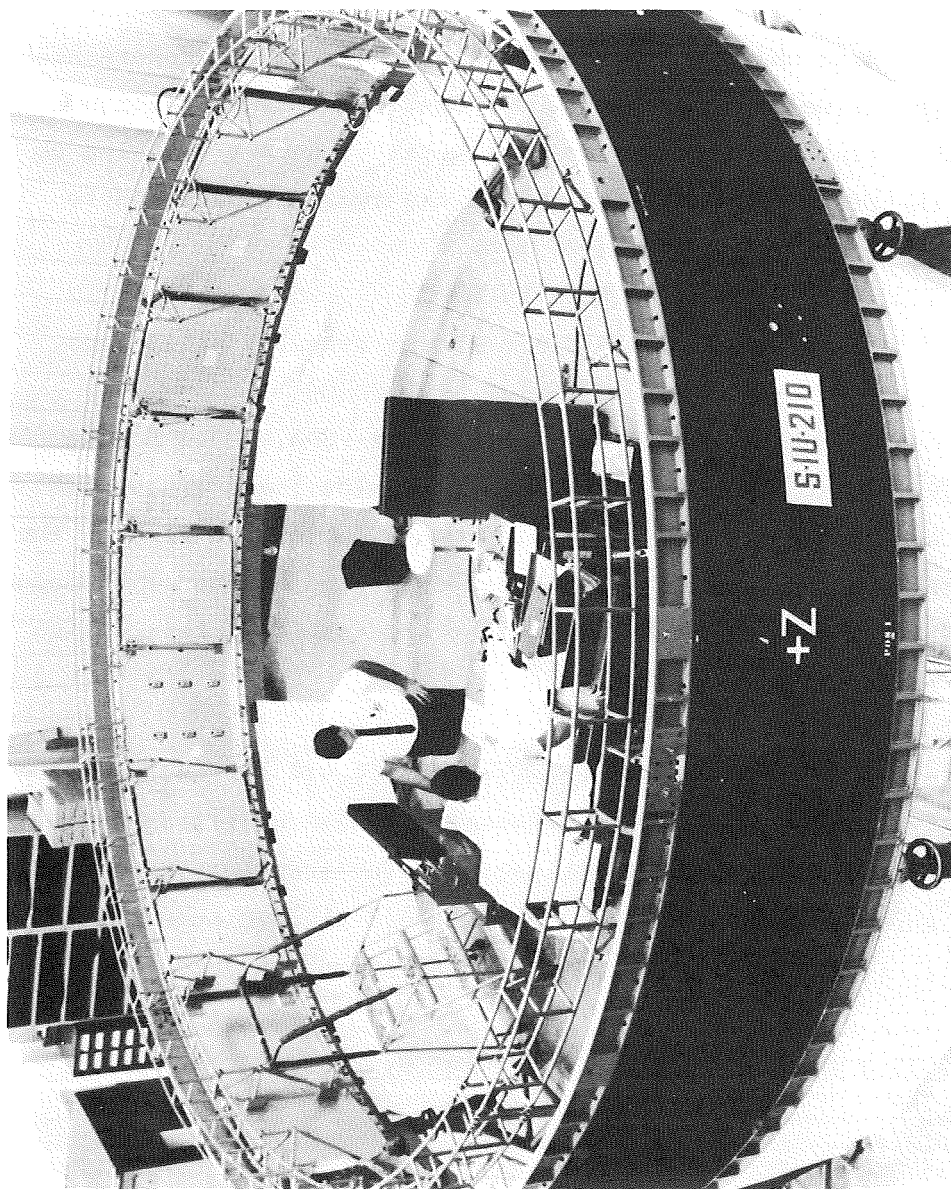
- IBM completed fabrication of S-IU-210 and began assembly operations.²³

- MSFC announced award of three parallel contracts--\$94,000 to Boeing Company; \$95,000 to Thompson-Ramo-Wooldridge, Inc.; and \$96,000 to General Electric Company--for further project definition work on the Voyager program. The contracts, effective through October 15, would furnish NASA with current data on Voyager spacecraft systems design and cover engineering study tasks.²⁴

June 22: MSFC awarded two contract extensions--\$149,914 to Bendix Corporation and \$149,485 to Boeing Company--to conduct specified design study tasks on the LSSM, a vehicle proposed for transporting men on the lunar surface. The modifications extended through August 1967 two parallel six-month contracts awarded the firms in June 1966.²⁵

June 23: The S-II-8 forward bulkhead underwent hydrostatic tests at Seal Beach.²⁶

June 25: The S-II-3 stage was moved to Station VII at Seal Beach for X-ray, dye-penetrant inspection of the LH₂ tank welds, completion of systems retest, and preparation for shipment.²⁷



ASSEMBLY OF S-IU-210 PROGRESSES

The instrument unit for the tenth Up-rated Saturn flight vehicle is shown in IBM's assembly building with cooling system tubing and bracket work to manifolds and cold plate in the preliminary stage.

June 26: Douglas initiated an abbreviated post-firing checkout of the S-IVB-209 stage prior to removing it from the acceptance test stand.²⁸

- Four test firings of the S-IVB battleship stage occurred at MSFC in the January - June 1967 period as follows: Test S-IVB-042 on April 21 for 235.8 seconds, Test S-IVB-043 on May 2 for 150.0 seconds, Test S-IVB-044 on May 18 for 4.7 seconds, and Test S-IVB-045 on June 26 for 199.0 seconds.²⁹

June 27: NASA Deputy Administrator Dr. Robert C. Seamans, Jr., visited MSFC and MTF to discuss progress in AA and Saturn launch vehicle programs.³⁰

June 29: Personnel at MTF installed S-IC-5 in the S-IC Test Stand and began incorporating a number of changes required prior to static firing of the stage.³¹

June 30: NAA, S&ID, completed systems installation and insulation close-out in the S-II-5 LOX tank.³²

- MSFC awarded two contracts: (1) a \$2.4 million, two-month contract extension to CCSD for procurement of long-lead-time items for additional S-IB stages, enabling Chrysler to continue procurements necessary to retain the capability of assembling four Uprated Saturn I boosters annually; (2) a \$14,811,540 fixed-price-incentive-fee contract to NAA for 60 additional H-1 rocket engines for use on first stages of the Uprated Saturn I boosters. This order increased the total number of engines purchased to 322 with delivery continuing through September 1968.³³

- In the first six months of 1967 Rocketdyne conducted 136 R&D F-1 engine tests at Edwards Field Laboratory (EFL) for a total firing

time of 292.11 minutes. Thrity-seven production engine tests at EFL during the same period totalled 53.41 minutes. In addition, ten engine tests totalling 6.49 minutes were performed at MSFC's West Area Test Stand. Rocketdyne delivered 11 F-1 production engines to Boeing during the same six-month period: one for the S-IC-7 stage, five for the S-IC-8 stage, three for the S-IC-9 stage, and two as S-IC flight stage spares.³⁴

June 30: In the January - June 1967 period Rocketdyne conducted 103 J-2 engine R&D tests at Santa Susana Field Laboratory (SSFL) for a total firing time of 315.07 minutes; conducted 66 J-2 engine production tests for a total duration of 174.05 minutes; and continued J-2 engine environmental testing at Arnold Engineering Development Center (AEDC), including S-IVB-501 verification tests proving re-start capability and S-II-501 verification tests. In this same period NASA accepted 19 J-2 production engines and allocated 17 of these as government furnished equipment to NAA, S&ID, for S-II flight stages and one as an S-II spare; and provided the other engine to DAC as as S-IVB flight stage engine.³⁵

In June: NAA, S&ID, completed the S-II-7 LH₂ bulkhead stud welding and placed the bulkhead in storage.³⁶

- The S-IC structural test program demonstrating the adequacy of the S-IC structure to withstand ultimate design conditions was completed.³⁷

JULY 1967

July 1: MSFC awarded McDonnell Douglas a \$496,024 contract to study advanced versions of the Saturn S-IVB orbital workshop. The contractor would explore concepts for a follow-on workshop for the Up-rated Saturn I and several more sophisticated versions for the Saturn V, with initial emphasis on uses of the stage in the AA program.¹

July 3: IBM completed factory checkout of S-IU-503 begun January 10 but interrupted February 15 to allow checkout of S-IU-502. Following completion of the checkout, the S-IU-503 was placed on an assembly stand and put in storage.²

July 6: Low bay checkout of the S-II-2 flight stage ended at KSC.³

- Painting of the S-IVB-211 stage was completed at the Space Systems Center and the stage labeled "Ready for Storage." Stage shipment to SACTO for firing was scheduled for April 1968.⁴
- At MSFC's Test Complex an S-IVB Battleship Stage performed a firing (Test S-IVB-046) of 436.39 seconds duration, accomplishing all planned test objectives.⁵
- An abbreviated post-firing checkout of S-IVB-209 was completed and the stage moved from the Beta I test stand to the VCL at SACTO.⁶
- The MSFC Director assigned Mission Operations (MO) Office the responsibility within Marshall for overall coordination of range safety requirements with other NASA Centers and, through KSC, with the Range Safety Office of the Air Force Eastern Test Range. The MO Office would participate with other NASA elements in overall coordination of range safety requirements, provide the focal point within

MSFC for such requirements, ensure that all MSFC elements involved were fully informed concerning range safety negotiations and problems, and ensure that MSFC contributions to range safety matters reflected a consolidated Center position.⁷

July 7: McDonnell Douglas personnel placed the S-IVB-504N stage in the Beta I Test Stand at SACTO and began prestatic firing checkout.⁸

- Laboratory personnel at MSFC completed modifications to an ATM mockup ascent stage.⁹

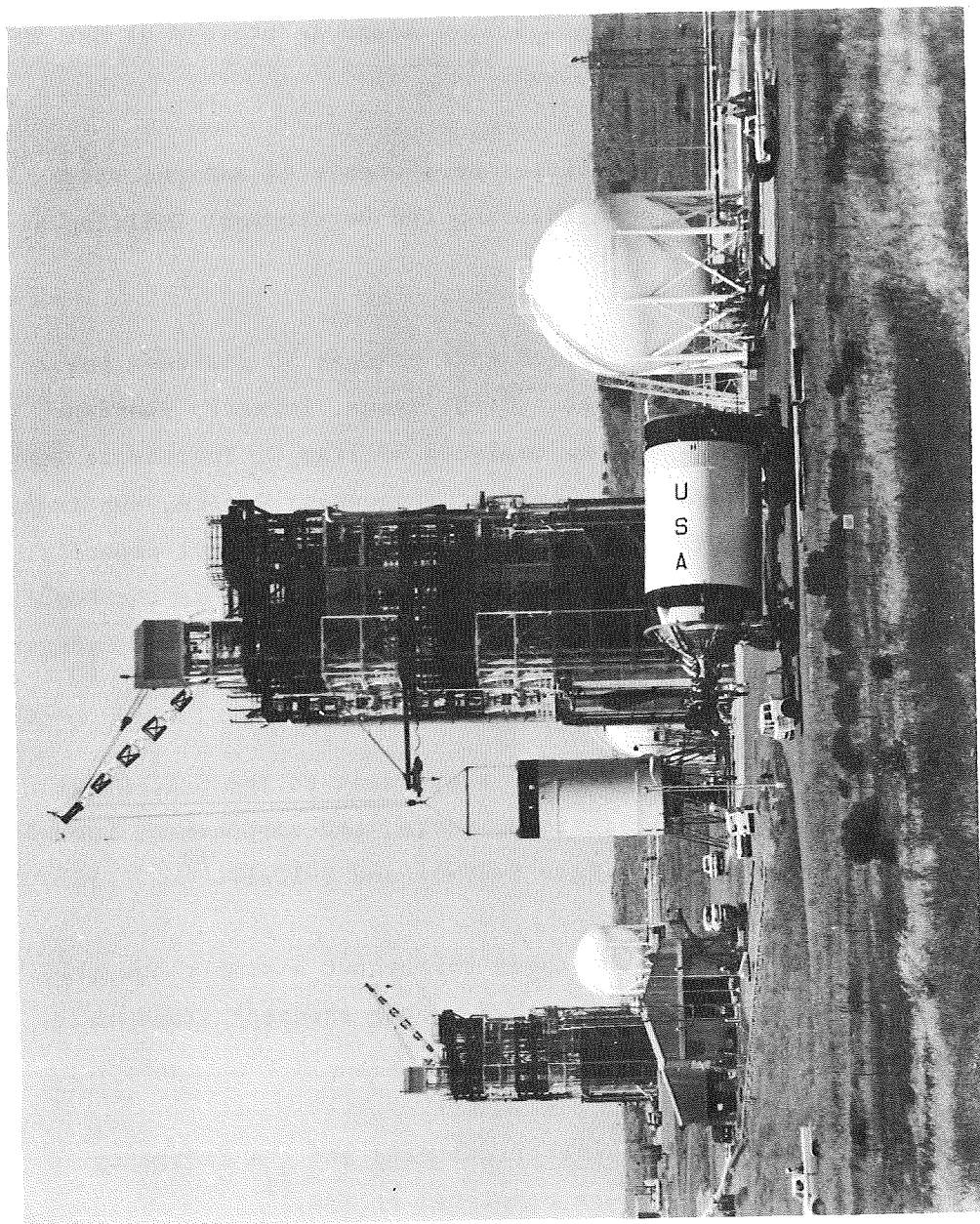
July 10: In Huntsville IBM completed S-IU-209 assembly work which had been hampered by shortages of components.¹⁰

July 11: The S-II-2 flight stage was erected atop the S-IC-2 stage in the KSC VAB High Bay 3. Destacking of SA-502 for removal of the H7-17 S-II spacer and preparation for erection of the S-II flight stage had occurred in June.¹¹

- NAA, S&ID, personnel completed preparations for shipping the S-II-3 stage and transferred it to the Navy dock at Seal Beach, California. It would be loaded aboard the AKD Point Barrow, scheduled for departure to MTF the next day.¹²

July 14: Boeing personnel placed the S-IC-8 thrust structure onto the four pylons of the Vertical Assembly Tower in the Michoud Manufacturing Building to begin vertical assembly of the stage.¹³

- Placement of the S-IU-502 atop the S-IVB-502 stage ended re-erection of the SA-502 flight vehicle in High Bay 3 at the KSC VAB. Placement of the S-IVB-502 atop the S-II-2 stage had occurred the previous day.¹⁴



S-IVB STAGES AT TEST SITE

Pictured in the foreground is the S-IVB-209 stage being transported from the test site; in the background is the S-IVB-504 stage ready for installation in the Beta I stand.

July 15: The first run of the S-IVB-503N All Systems Test (AST) was completed in the VCL at SACTO.¹⁵

July 18: CCSD placed the fully checked S-IB-7 stage in storage at MAF to await shipment and flight scheduling.¹⁶

July 19: S-IVB-209 post-firing activities were completed and the stage was placed in storage in the Engineering and Development Building at SACTO.¹⁷

July 20: MSFC's Saturn IB Program Office made changes in resident personnel assignments on the West Coast. O. S. Tyson, formerly Resident Manager of the Sacramento Office, replaced William C. Fortune as Deputy Resident Manager, NASA/MSFC Resident Management Office, Huntington Beach, California. Mr. Fortune had been serving in a dual capacity as Chief, West Coast Technology Utilization Office, and as the Deputy Resident Manager. C. L. Flora replaced Mr. Tyson as Resident Manager of the Sacramento Office, and J. J. Pennello became his Deputy.¹⁸

July 21: NASA awarded Boeing a \$2,275,000 supplement to the S-IC stage contract for long-lead-time materials, parts, and components, including engineering services for stages S-IC-16 and S-IC-17.¹⁹

- The S-IU-504, plagued by parts shortages throughout assembly and still having a number of shortages, was moved to the checkout stand to undergo systems checkout.²⁰

July 24: The AS-501 launch vehicle electrical mate and the Emergency Detection System (EDS) tests were completed at KSC.²¹

- Boeing completed the S-IC-6 stage post-manufacturing checkout.²²

July 24: MSFC awarded Astro Space Labs, Inc., a \$93,136 contract for further development and testing of a remotely controlled device to handle tools, equipment, and men in space. Called a serpentuator, the device was invented by Hans Wuenschel of MSFC's ME Lab. It consisted of links connected by powered hinges, which could be remotely controlled from either end of the device; one end would be connected to the spacecraft; one would be free. Small versions of the device could be powered by a hand pump or batteries; larger versions, by electric motors.²³

July 25: CCSD personnel at MAF removed S-IB-9 from the Checkout Stand. Preparations for storing the stage began, but actual storage awaited resolution of possible contamination in two of the engines.²⁴

- Checkout station hookup to S-IU-209 was completed by IBM and checkout operations initiated.²⁵
- The S-IVB-212 stage entered systems checkout at McDonnell Douglas Space Systems Center.²⁶
- The S-IVB-503N stage was placed in storage at SACTO following post-firing checkout.²⁷

July 26: The collapse of the emergency fuel drain duct forced termination of the first S-IC-5 tanking test at MTF.²⁸

- NASA formally accepted S-IC-6 from Boeing and preparations were started for shipment of the stage from Michoud to MTF for static testing.²⁹
- The S-II-3 stage, shipped from Seal Beach aboard the AKD Point Barrow, arrived at MTF.³⁰

July 26: NASA Administrator James E. Webb testified concerning the NASA FY 1968 authorization bill before the Senate Committee on Appropriations' Subcommittee on Independent Offices. Asked by Senator Spessard Holland of Florida to make a choice between a substantial cut in funding for the AA program and the Voyager program, Webb replied that both were vital to the U.S. space effort. "The Apollo application is a small investment to expend on something you have already spent \$15 billion to get and it seems to me that this is important.

"On the other hand, the United States, if it retires from the exploration of the planetary field, in my view...will face the most serious consequences because the Russians are going to be moving out there and our knowledge of the forces that exist in the solar system can affect the earth and can be used for many purposes to serve mankind or for military power...." Criticized by Senator Holland for refusing to make a choice, Webb said he did not want "to give aid and comfort to anyone to cut out a program. I think it is essential that we do them both."³¹

- NASA selected Martin Marietta Corporation to negotiate a 27-month, \$98-million CPFF contract for payload integration of experiments and experiment support equipment on AA spacecraft. Tasks would be performed at NASA's three manned space flight centers: (1) MSFC work would involve the orbital workshop and ATM; (2) MSC work, the meteorological and earth resources payloads; and (3) KSC work, the test integration planning and support for launch operations. Selection of the contractor followed the competitive definition phase in which Martin and the Lockheed Missiles and Space Company studied AA payload integration under parallel, \$2-million, fixed-price contracts.³²

July 28: The S-II-3 stage was positioned in the A-1 Test Stand at MTF and the prestatic firing checkout started. This was the first stage to be installed in the newly activated test stand.³³

July 28: IBM began systems checkout of the S-IU-504.³⁴

- All programmed testing in the Saturn V Configuration II Dynamic Test Series was completed. Configuration II testing included the yaw test sequence completed May 15, the pitch test sequence completed June 2, the roll test sequence completed June 10, and the longitudinal test sequence concluded in early July.³⁵

July 31: MSFC and KSC signed a Memorandum of Agreement, on "KSC Use of Selected MSFC Personnel," formalizing an informal agreement by the Directors of the two Centers. The agreement laid the ground rules for use of MSFC personnel by KSC to (1) support the AS-501 launch scheduled for September 1967, and to (2) support projects of mutual interest and importance to both Centers which would require additional specialized personnel for temporary periods of time.³⁶

In July: NAA, S&ID, positioned the S-II-6 stage in Station VI at Seal Beach and began preparations for starting systems installation.³⁷

- Space Data Corporation initiated design of the Super Loki Dart vehicle as a low-cost replacement for the Cajun Dart used for high altitude wind measurements. The designers hoped to develop a Super Loki system capable of achieving an altitude of 95 kilometers at less than one-half the cost of the Cajun Dart for use by MSFC.³⁸

AUGUST 1967

August 1: The first AS-501 vehicle overall test (OAT-1), plugs in, begun July 27, was completed in the VAB at KSC.¹

August 3: The S-IC-T Battleship/All Systems stage successfully fired for 41.74 seconds in Test No.22, the third attempt in two days to complete a 40-second captive firing at MSFC's S-IC Test Complex. The test demonstrated the operational readiness of the test complex, the S-IC-T stage, and the ground support equipment. It also provided training for KSC launch crews and demonstrated the launch integrity of the Saturn V liftoff switch.²

- CCSD completed preparation of S-IB-9 for storage and moved the stage to its storage position at Michoud.³
- Preparations for storing the S-IVB-211 stage were completed and the stage was placed in storage at Huntington Beach.⁴

August 4: An integrated systems test ended the prefire subsystem check-out of the S-IVB-504N stage in the Beta I stand at SACTO.⁵

August 6: The AS-501 OAT #2 test ended at KSC and preparations began for installation of the S-II stage ullage motor ignition system.⁶

August 7: McDonnell Douglas transferred the S-IVB-205 stage from storage in VCL Tower No. 2 to Tower No. 1 for cleaning prior to post-storage modification at SACTO.⁷

- NASA issued three modifications totaling \$30.9 million to NAA's Saturn V S-II stage contract: first, valued at \$5.5 million, provided for equitable adjustment of S-II stage changes previously ordered; second,

valued at \$5.8 million, covered seven changes involving KSC ground support equipment; and third, valued at \$19.4 million, was for 12 changes covering alterations of selector switches and insulation of the entire S-II stage.⁸

August 8: MSFC completed modification of the Apollo BP-30 command module as a backup for the AS-502 mission and placed it in storage. Check-out of the BP-30 service module, also modified, began.⁹

August 9: Prestatic checkout of the S-IVB-504N stage in the Beta I Stand at SACTO ended with a successful simulated static firing countdown.¹⁰

August 10: Boeing personnel successfully completed the second attempt to propellant load test the S-IC-5.¹¹

- NASA converted the \$13.5 million systems integration portion of CCSD's Up-rated Saturn I contract to a CPIF agreement and extended the contract through April 1969. Under the new arrangement, which raised total value of the systems integration portion to \$35.5 million, Chrysler's fee would be judged according to the performance, quality, and timeliness of the work, which would be performed at MSFC and MAF.¹²

August 11: Dr. von Braun advised management that the initial objectives of the S-II Special Task Team formed in January 1967 had been met. He directed that Phase II of the Task Team effort must be vigorously pursued. Phase II effort would include (1) establishing the ability at Seal Beach under the direction of the Resident Manager (RM) for carrying on that part of the Task Team's functions relating to the problem-solving process; (2) retaining the identity of the original team members at Huntsville to maintain a continuing interest in day-to-day progress at Seal Beach; and (3) continuing the present system

of processing action items--weekly meetings between the RM office group and the contractor. Dr. von Braun further advised that "the S-II must continue to be our (MSFC) highest priority business until events have demonstrated that it is no longer the pacing item in the Saturn V launch vehicle."¹³

August 11: Officials from NASA Headquarters, field centers, and MSFC prime and local support contractors ended a three-day MSFC conference on organizational communication. Conference objectives were to: (1) review the state-of-the-art and current academic pursuits in organizational communication in government and industry; (2) exchange experiences and knowledge among NASA personnel; and (3) identify areas of common interest with MSFC contractors. Representatives from U.S. Civil Service Commission and selected universities attended as observers.¹⁴

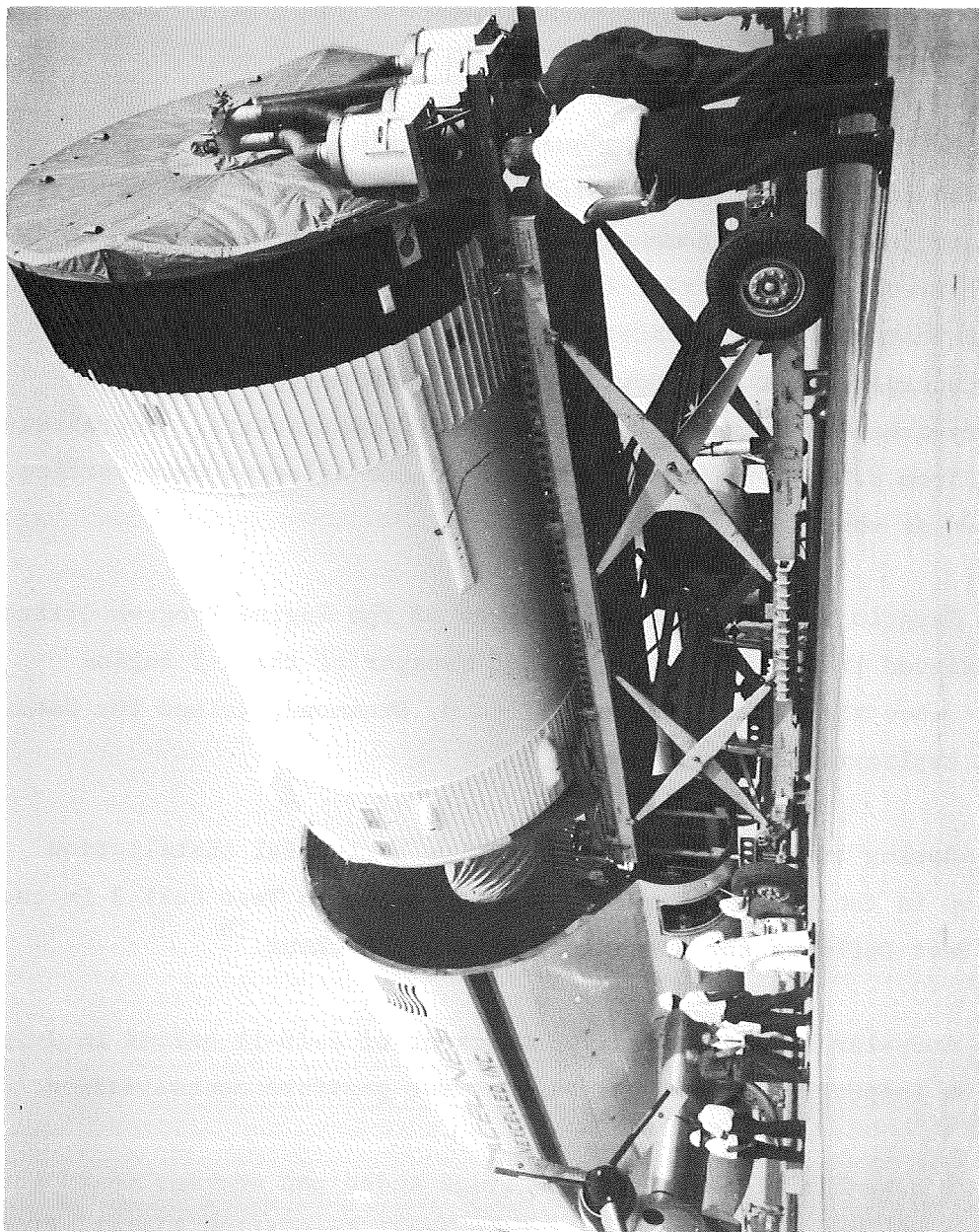
August 13: Saverio F. Morea, Deputy Manager of the Engine Program Office, was assigned the additional duties of Manager of the J-2 Engine Project when the former Manager, Floyd M. Drummond, joined the Saturn Apollo Applications Office.¹⁵

August 14: Boeing transferred S-IC-7 from its horizontal installation position in the Michoud Manufacturing Building to Test Cell 2 in the Stage Test Building for post-manufacturing checkout.¹⁶

August 15: Chrysler resumed prestatic checkout of S-IB-11 halted in July to allow inspection of the H-1 engines for possible contamination.¹⁷

- Structural assembly of the S-IVB-508 stage ended and workmen moved the stage to the Insulation Chamber for internal insulation installations.¹⁸

August 16: At MAF, Boeing personnel completed the S-IC-4 stage post-static checkout and placed the stage in storage.¹⁹



S-IVB-505N IS LOADED ONBOARD SUPER GUPPY

McDonnell Douglas personnel at Huntington Beach watch as the S-IVB-505N stage is loaded onboard the Super Guppy aircraft for transport to the Sacramento Test Center.

August 16: McDonnell Douglas installed the S-IVB-507 stage in Assembly Tower 4 at Huntington Beach and began J-2 engine installation.²⁰

- Problems with the Beckman Digital Data Acquisition System (DDAS) caused rescheduling of the S-IVB-504N stage acceptance firing to August 23 at SACTO.²¹

August 17: The S-IVB-505N stage was loaded aboard the Super Guppy aircraft at Huntington Beach and transported to SACTO for acceptance testing.²²

- MSFC completed fabrication of the Up-rated Saturn I Nose Cone No. 3. The nose cone, unpainted, was placed in storage pending approval of the addition of a jettison motor designed to pull the nose cone and spacecraft-launch vehicle adapter (SLA) panels from the payload.²³

August 18: The Space Vehicle Simulated Flight Test on AS-501, suspended the previous day due to a power transfer problem, was successfully concluded.²⁴

August 21: NAA, S&ID, completed meridian welding on the aft facing sheet gores for the S-II-10 stage common bulkhead.²⁵

- The S-IVB stage contractor completed structural assembly of stage S-IVB-506N and moved the stage from Assembly Tower 2 to Assembly Tower 5 at Huntington Beach to accomplish engine installation.²⁶
- Dr. von Braun designated the Manager of the Saturn V Program, Dr. Arthur Rudolph, as MSFC's Launch Vehicle Representative for the Apollo 4 mission. As such, Dr. Rudolph would be the official MSFC spokesman to the Launch Director in all matters affecting LV systems. At the LC he would also be the spokesman for the MSFC operations support

organization (HOSC) established in Huntsville. Appointed as his alternate was Ludie B. Richards, Director of MSFC's Technical Systems Office.²⁷

August 22: On completing helium bottle changeout operations, Boeing personnel at Michoud moved the S-IC-3 stage from the Stage Test Building to the Manufacturing Building for temporary storage.²⁸

August 23: An indication of "fire" on the J-2 engine terminated the S-IVB-504N acceptance firing at 51.23 seconds. Post-test investigation revealed that a section of the fire detection wiring set to note "fire" at 170 to 200 degrees Fahrenheit was improperly touching a fuel turbine inlet duct having estimated external temperatures of 500-600 degrees Fahrenheit.²⁹

- Structural fabrication of the S-IU-211 unit began at IBM's Huntsville facility.³⁰
- MSFC awarded Rocketdyne Division of NAA a \$1.4 million contract for continued investigation of the advanced aerospike rocket engine. Work on the 250,000-pound-thrust engine had been underway about a year and a half for NASA's Office of Advanced Research and Technology.³¹

August 25: S-IC-5 underwent a full-duration acceptance firing test at MTF. Despite several problems, the test was considered satisfactory with all major objectives achieved.³²

August 26: The S-IVB-504N stage performed successfully an acceptance firing of approximately 438 seconds duration in the Beta I Stand at SACTO.³³



AS-501 IN TRANSIT

Pictured on its mobile launcher with its reflection mirrored in the Banana River at Kennedy Space Center is the first Apollo Saturn V flight vehicle (AS-501), enroute from the Vertical Assembly Building to Launch Complex 39 some 3.5 miles distant.

August 26: At KSC the AS-501 traveled on its mobile launcher from the VAB, where vehicle assembly and prelaunch preparation had occurred, to LC-39, Pad A (LC-39A), some 3.5 miles away.³⁴

August 28: Formal turnover of the S-IC-4 stage to NASA by Boeing occurred on dock at Michoud.³⁵

August 30: Chrysler completed necessary preparations and placed the S-IB-10 stage in storage at Michoud.³⁶

- The MSFC Director established the MSFC Automatic Data Processing (ADP) Management Decision Group to accomplish a plan for overall management of the Center's ADP resources on a coordinated basis and in consonance with the findings of the ADP study initiated in 1966.³⁷

August 31: McDonnell Douglas completed an abbreviated post-firing check-out on the S-IVB-504N stage and then transferred it from the Beta I Test Stand to the VCL for storage.³⁸

In August: The SA-501 pre-operational safety review was completed and follow-on effort initiated. This comprehensive safety review, the first for a Saturn vehicle, was proposed by the newly established MSFC Safety Board. The review resulted in a number of revelations that would have otherwise remained undisclosed or necessitated last minute adjustments.³⁹

SEPTEMBER 1967

September 1: NASA requested that the S-IC-6 stage already prepared for shipment to MTF, be retained in storage at Michoud to allow Boeing to give priority to work supporting activities on S-IC-1 and S-IC-2 at KSC and on S-IC-3 at Michoud.¹

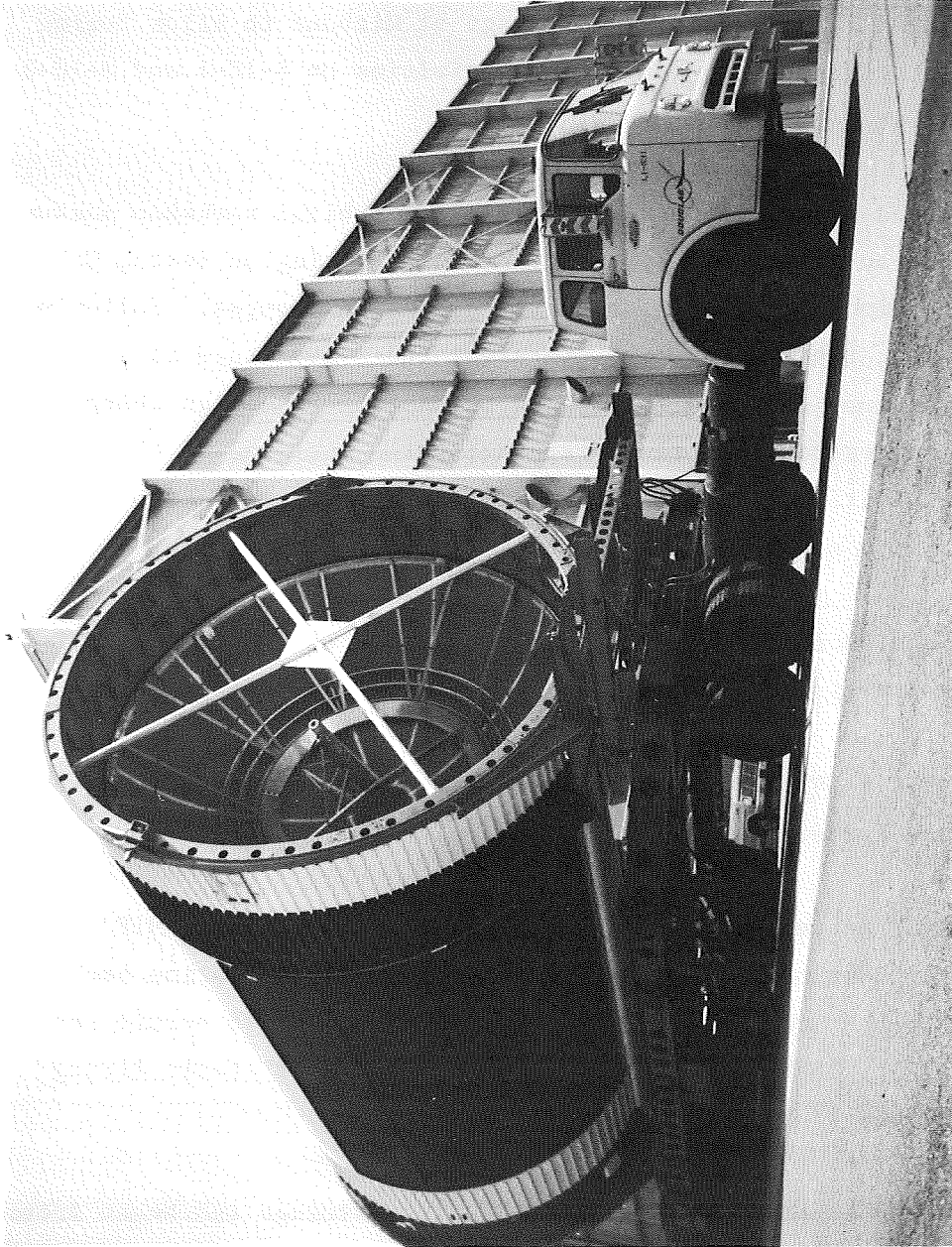
- MSFC returned a McDonnell Douglas-built S-IVB orbital workshop mockup to the contractor's Space Systems Center in Huntington Beach, California, for incorporation of a number of design changes. Following modification, the mockup would represent the S-IVB stage as a manned space laboratory designed for use in the AAP. The design changes included relocation of a floor separating two sections of the stage's LH₂ tank, addition of a ceiling and other fixtures, and relocation of some of the experiment stations.²
- McDonnell Douglas installed the S-IVB-505N stage in the Beta I Test Stand for pre-firing checkout.³

September 6: The S-IVB-506N entered systems checkout at the Huntington Beach Space Systems Center.⁴

- A LOX/LH₂ tanking test of the S-II-3 stage was completed in MTF's A-1 Test Stand. During the test a piece of sidewall insulation became unbonded in the area of cylinders No. 1 and No. 2. To permit insulation repair, test officials rescheduled the first static firing from September 12 to September 19, 1967.⁵

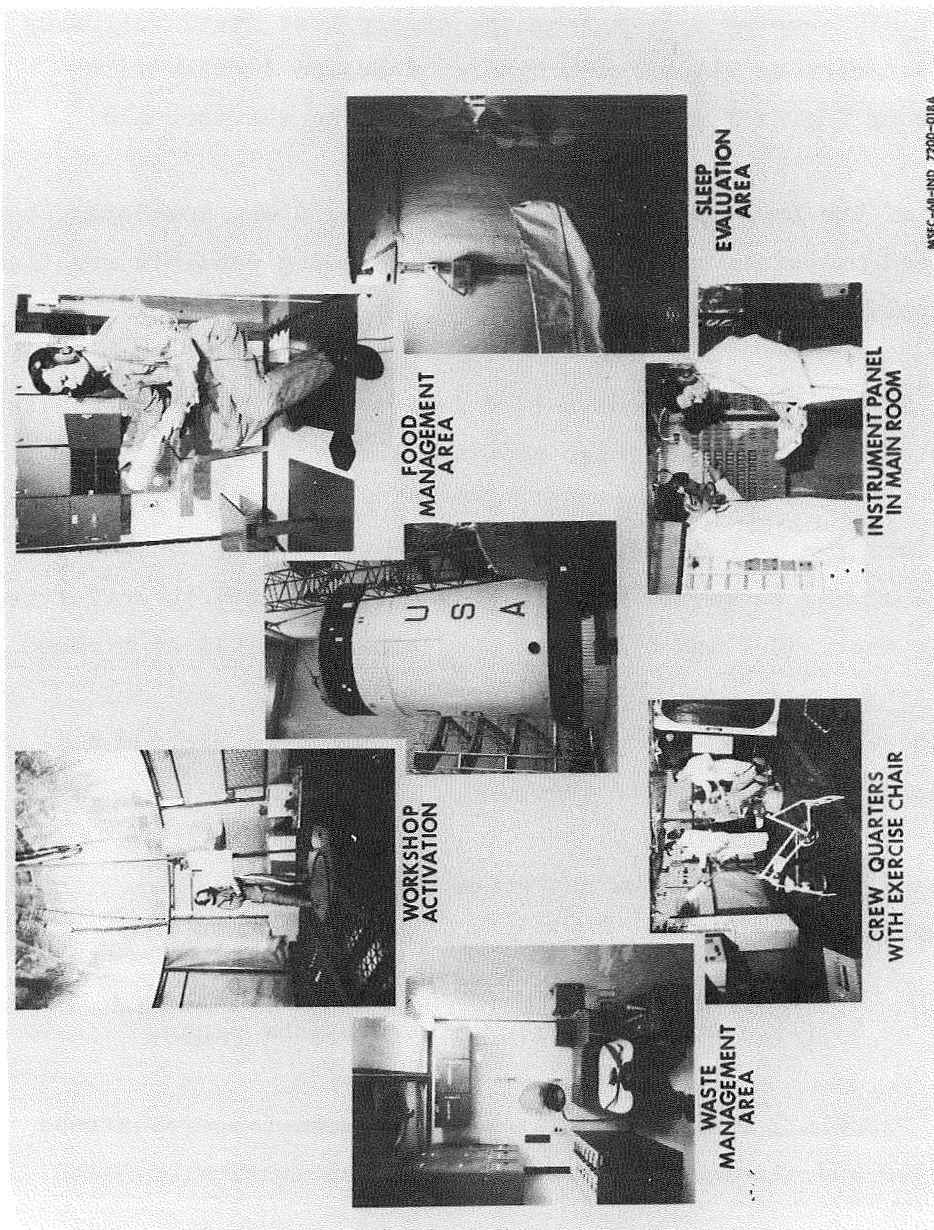
September 7: IBM personnel removed S-IU-503 from storage and began incorporation of 33 modifications required prior to its shipment to KSC.⁶

September 9: S-II-4 entered NAA, S&ID's, Test Operations for systems checkout. Stage modifications would continue parallel with the checkout activity at Checkout Station IX.⁷



MOCKUP RETURNED FOR MODIFICATION

Ready for unloading at the McDonnell Douglas Space Systems Center is an S-IVB Orbital Workshop Mockup returned to the contractor by MSFC for incorporation of design changes.



S-IVB WORKSHOP ELEMENTS

Technicians in the above photographs are demonstrating the activation and use of living quarters and experiment stations as designed for the S-IVB workshop. McDonnell Douglas, under contract to MSFC, will continue to explore concepts for more sophisticated versions of the workshop for the Up-rated Saturn I and the Saturn V.

September 11: Boeing completed vertical assembly of the S-IC-8 stage.⁸

- Personnel at MTF removed S-IC-5 from the static test stand following a three-day delay to allow inspection of a broken turbine inlet transducer of Engine 2 and location of a missing thermocouple.⁹
- Manufacture of the Uprated Saturn I Nose Cone No. 4 was completed, but MSFC delayed preparations for its shipment pending possible modification to apply a jettison motor.¹⁰

September 12: Boeing Company moved S-IC-3 from storage to the Stage Test Area at Michoud for post-storage modifications and tests.¹¹

- NASA asked that the S-IC-4, readied for shipment to MTF, be retained in storage at MAF to permit MSFC to give work priority to activities supporting the S-IC-1 and S-IC-2 at KSC, and the S-IC-3 at Michoud.¹²
- Boeing personnel returned the S-IC-5 stage from MTF to Michoud for refurbishment and post-static checkout.¹³
- McDonnell Douglas concluded the AST which ended systems checkout of the S-IVB-212 stage.¹⁴
- Fabrication of S-IU-505 ended and assembly operations began.¹⁵

September 14: McDonnell Douglas completed post-checkout modifications to S-IVB-210 and placed the stage in storage at Huntington Beach.¹⁶

September 15: NAA, S&ID, began vertical assembly of the S-II-8 stage.¹⁷

September 16: The S-IC-8 stage was removed from the vertical assembly tower, lowered onto a transporter, and prepared for transportation

to Horizontal Assembly Position #1 in the Michoud Manufacturing Building.¹⁸

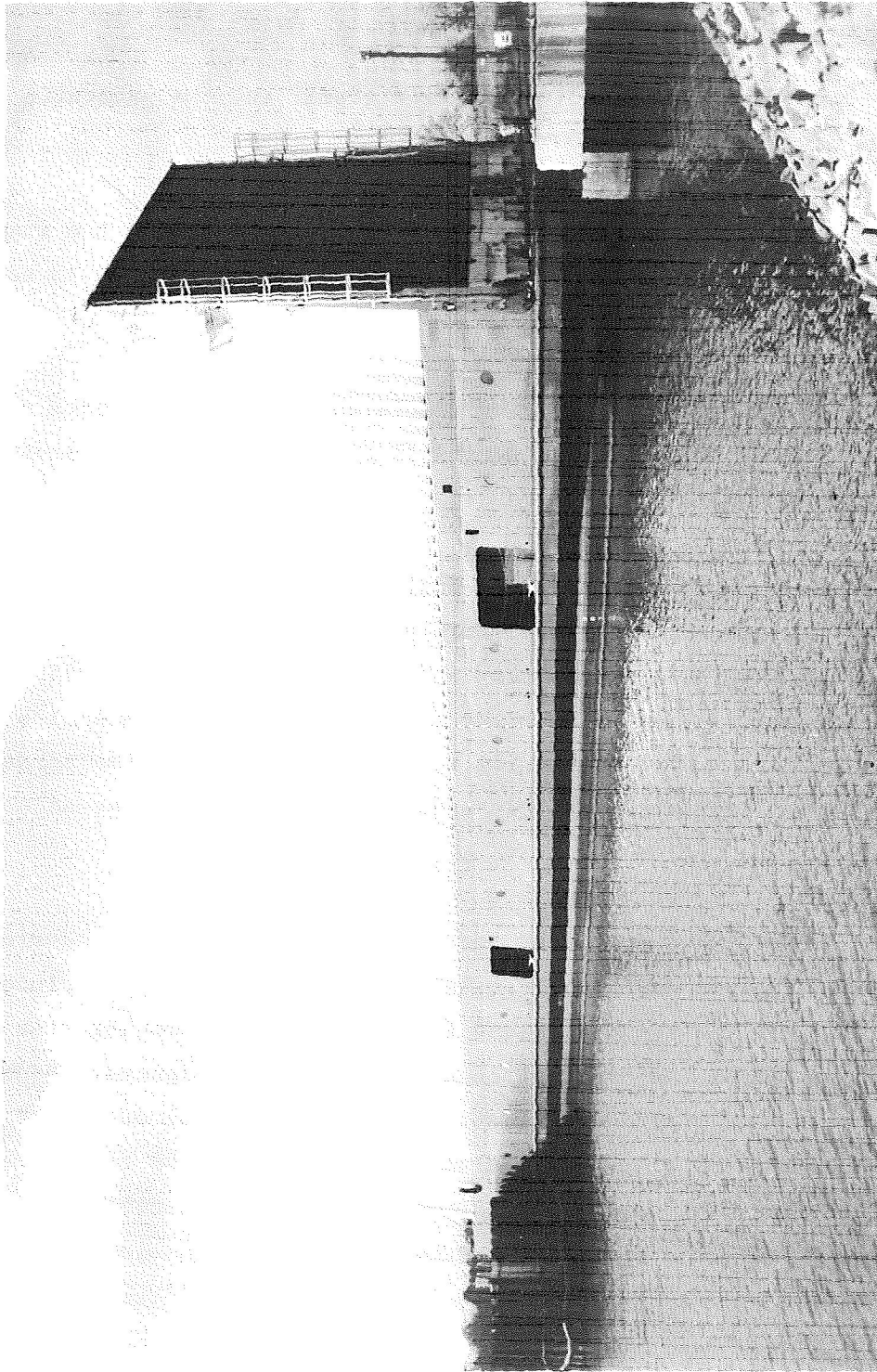
September 17: NAA, S&ID, completed insulation repair and the prestatic firing checkout of S-II-3 at MTF.¹⁹

- Vertical buildup of the S-II-7 stage ended with acceptance of the stage closeout weld joining cylinders 2 and 3. NAA, S&ID, prepared to test the stage to assure proper weldments.²⁰

September 18: The S-II stage contractor completed pneumostatic tests of the S-II-7 stage. Inspection revealed 11 discrepancies that required repair by rewelding.²¹

- NASA executed a \$159,716,477 contract modification (Supplemental Agreement 813) with NAA, S&ID, for fabrication of five Saturn S-II stages, S-II-11 through S-II-15, completing S-II requirements for the 15 Saturn V vehicles currently approved for development in the Apollo program. Authorization and funding to procure long-lead-time hardware for these stages had been given during the first quarter of 1967.²²

September 19: The S-II-3 stage fired for approximately 65 seconds during its first acceptance test at MTF. Main objectives achieved included qualification of the A-1 Test Stand flame bucket and demonstration of the stage, stand, and control room compatibility. Special objectives accomplished included evaluation of the slow chill of the LH₂ tank, achievement of a 3800-gallon-per-minute maximum LOX fill rate in the fast-fill mode, and verification of the LH₂ fast-fill and over-fill sensors. Another special objective, a sidewall insulation test at cryogenic temperature, failed due to minor pinhole leaks in the sidewall insulation.²³



BARGE ORION AT NASA DOCK

Shown is the barge Orion following modification making the cargo area larger. The former shuttle barge will now be used to transport S-IC stages to and from manufacturing, test, and launch sites.

September 20: NASA Deputy Associate Administrator Dr. Alfred J. Eggers, Chairman of the NASA Safety Panel, held a Safety Review at MSFC. At the meeting, attended by safety representatives from all NASA agencies, the Administration's Safety Organization as well as future plans for safety were discussed.²⁴

September 22: NAA, Inc., merged with Rockwell-Standard Corporation to create North American Rockwell (NAR) Corporation.²⁵

- The Saturn V Program Manager announced the retirement, effective October 31, of Colonel Samuel Yarchin, the S-II Stage Project Manager since February 1965. Appointed to replace Col. Yarchin as Manager of the S-II Project, effective September 23, was Roy E. Godfrey, who had been serving as Senior Deputy Manager of the Project.²⁶

September 25: A branch of the Huntsville Post Office opened at MSFC. Manned by the Postal Department, the new office would provide complete postal services for the Center's Redstone Arsenal Complex. The address of MSFC changed to National Aeronautics and Space Administration, George C. Marshall Space Flight Center, Marshall Space Flight Center, Alabama 35812.²⁷

- The barge Orion, formerly used as a shuttle barge in MSFC's West Coast transportation fleet but recently modified to provide a larger cargo area suitable for S-IC stage transport, arrived at MSFC on its first trip up the Mississippi, Ohio, and Tennessee Rivers. The Orion would be used to transport stages from the manufacturing site at Michoud to the test site at MTF and later to the KSC launch site. The barge might also supplement the USNS Point Barrow as an ocean-going ship to transport S-II stages from the West Coast to MTF.²⁸

- Post-storage checkout of both the S-IVB-503N and the S-IVB-504N stages began at the SACTO.²⁹

September 27: Start of the AS-501 Countdown Demonstration Test (CDTT) climaxed a month of prelaunch preparations at LC 39A.³⁰

- Chrysler personnel completed prestatic checkout of the S-IB-11 stage and began preparations for shipping the stage to Huntsville for static firing.³¹
- The S-II-3 stage underwent a full-duration (358-second) static firing with termination automatically initiated by LOX depletion. The firing demonstrated the functional integrity of the stage under static firing conditions and verified that the stage met specified acceptance test requirements. Special objectives achieved included evaluation of the slow chill of the LH₂ tank performance in a sidewall insulation test.³²

September 28: The S-IVB-205 stage was placed in the vertical checkout stand for post-storage modifications at SACTO.³³

In September: Structural assembly of the S-IVB-509 tank assembly was completed. During the assembly workmen had discovered an out-of-contour area on the aft LOX dome too serious for rework, necessitating its replacement with the S-IVB-510 aft dome.³⁴

OCTOBER 1967

October 3: McDonnell Douglas completed fabrication of the S-IVB-510 stage LOX tank assembly at Santa Monica using the S-IVB-511 aft LOX dome as a replacement for the 510 dome reassigned to the S-IVB-509 stage. The contractor shipped the completed assembly to Huntington Beach to be joined with the LH_2 tank assembly.¹

- A full-scale MDA mockup was completed according to current documentation. The mockup would be updated to reflect changes as the design of the MDA progressed.²

October 4: For the Saturn V program NASA purchased nine additional S-IVB stages from the McDonnell Douglas Corporation for \$146.5 million. This fulfilled requirements for the currently approved 15 Saturn V and 12 Uprated Saturn I vehicles. Delivery would begin in April 1968 and end in May 1970. The purchase brought the total S-IVB contract value for both vehicles to \$957,182,093 and the total number of stages purchased to 27. McDonnell Douglas also received a \$24 million CPFF contract extension for S-IVB launch services at KSC, which increased the total value of that contract to \$34 million. Covered were stage receipt, checkout, launch, and launch evaluation.³

- NASA informed the Boeing Company that action to procure 10 S-IC stages, S-IC-16 through S-IC-25, would be stopped. Boeing had submitted a proposal on July 3 and an adjusted proposal on September 20 covering the necessary supplies and services for fabrication and delivery of the stages.⁴
- MSFC used AEDC facilities to investigate preparation of a spent rocket stage for human occupancy in space. The investigation involved dumping 840 gallons of super-cold liquid nitrogen (LN_2) through a "dead"

or inactive J-2 rocket engine. Simulating 100,000 foot altitude, this dumping experiment would pave the way for astronauts to move inside an orbiting stage and use tanks as living quarters for a space station.⁵

October 5: Technicians at the Beta I Test Stand at SACTO completed a simulated static firing countdown on the S-IVB-505N stage.⁶

October 6: MSFC issued a revision to the MAF Charter approving changes in the organizational and functional responsibilities.⁷

- S-II-11 stage assembly activity began at Seal Beach with loading of the aft facing sheet gores on the welding fixture.⁸

October 8: McDonnell Douglas completed leak checks on the S-IVB-509 tank assembly and moved the stage from the Huntington Beach Assembly Tower 8 to the Insulation Chamber for insulation installations.⁹

October 10: Mating of the fifth engine completed F-1 engine installation in the S-IC-8 stage at Michoud.¹⁰

- Replacement of a defective hydraulic accumulator necessitated a 24-hour hold in the S-IVB-505N acceptance-firing countdown.¹¹

October 12: NASA Administrator James E. Webb held a press conference on management changes: (1) George S. Trimble, Jr., Director of Advanced Manned Missions Program, OMSF, was appointed Deputy Director of MSC. (2) NASA Deputy Associate Administrator for Space Science and Applications Edgar M. Cortright was appointed Deputy Associate Administrator for Manned Space Flight. He would be replaced by Donald P. Hearsh, the Voyager Program Manager. (3) MSFC Deputy Director Eberhard F. M. Rees was named to serve as Special Assistant in Manufacturing Problems to MSC Apollo Spacecraft Program Manager George M. Low.¹²

October 12: In the Beta I stand at SACTO, the S-IVB-505N stage successfully performed an acceptance firing of 448 seconds duration, with cutoff initiated by LOX depletion.¹³

October 14: The final portion of the CDDT on the AS-501 vehicle ended at KSC.¹⁴

October 15: McDonnell Douglas began LH₂ tank hardware installations in the S-IVB-508 stage.¹⁵

October 16: NASA terminated procurement of long-lead items for stages S-IC-16 and S-IC-17 with Boeing.¹⁶ (Note October 4 entry)

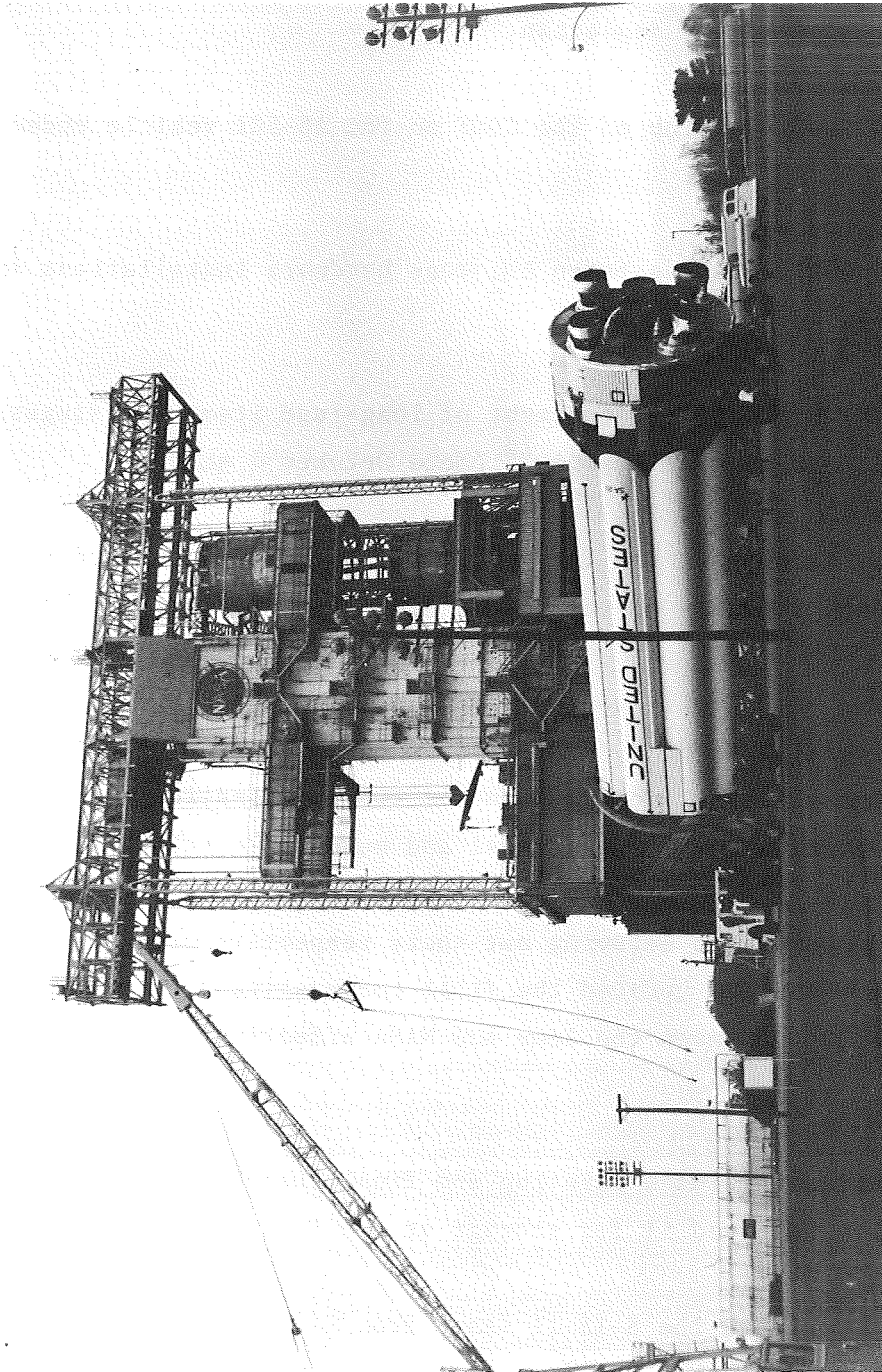
October 18: Installation of the last major component, the forward skirt, ended vertical assembly of the S-IC-9 stage in the VAB at Michoud.¹⁷

- Dr. Wernher von Braun, Director of MSFC, and Maj. Gen. Charles Eifler, Commanding General of U. S. Army Missile Command, signed an agreement providing mutual assistance between the two organizations. Detailed in the agreement are the operational and support relationships between the two including provision of facilities, services, materials, and equipment necessary in carrying out their respective missions. This agreement revised and updated the first cooperative agreement signed in December 1968 between the Army and NASA affecting what is now MSFC.¹⁸

- McDonnell Douglas completed painting and final inspection of the S-IVB-212 stage and prepared it for storage at the Space Systems Center.¹⁹

October 20: CCSD shipped the S-IB-11 stage from MAF aboard the barge Palaemon to MSFC/Huntsville.²⁰

- Pre-static checkout of S-IB-12 began at MAF.²¹



S-IB-11 ARRIVING AT TEST SITE

The S-IB-11, on its transporter, is moved from the MSFC dock to the Static Test Tower East for acceptance testing. Cranes and pulleys dangle in readiness as preparations for installation of the stage in the stand begin.

October 22: Major structural assembly of the S-II-10 stage progressed as NAR personnel completed the final meridian weld on the forward facing sheet of the common bulkhead and placed it in storage to await the common bulkhead buildup. Buildup of the aft facing sheet had been completed in August.²²

- Systems checkout of the S-II-4 stage was completed by the Space Division of NAR Corporation.²³

October 23: At Seal Beach, NAR completed systems installations in the S-II-5 stage and transferred it to Test Operations where preparations for systems checkout commenced.²⁴

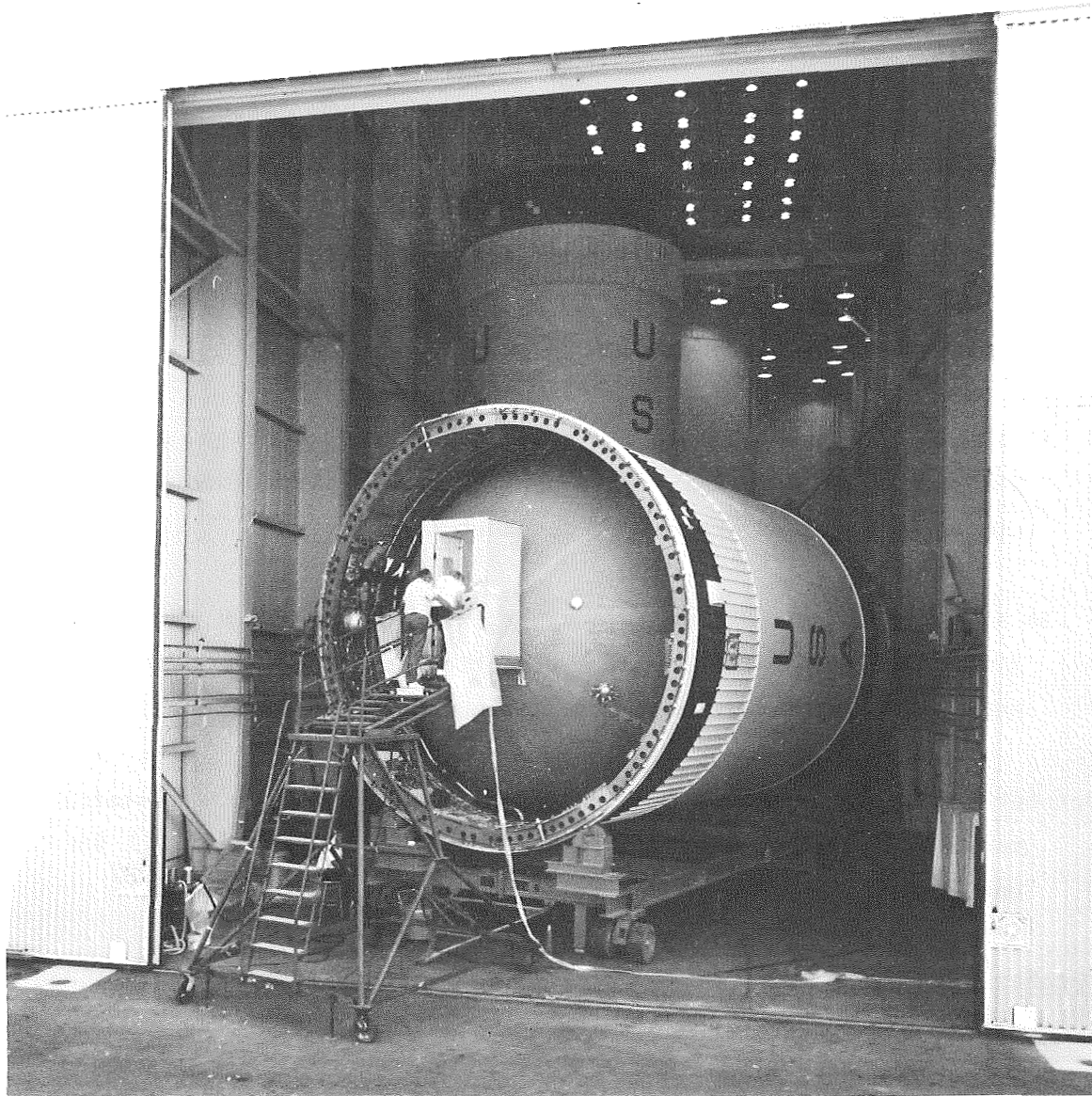
- A satisfactory simulated test rerun ended systems checkout of the S-IU-504 begun July 28. Failure of parts and parts shortages continuously hampered progress throughout the checkout.²⁵
- In a letter to all MSFC employees, Dr. Wernher von Braun, Director, stated that possibility of a reduction in personnel existed if NASA's FY 1968 budget was cut as proposed by Congress.²⁶

October 24: Rework of S-II-7 weld defects discovered in pneumostatic tests were completed by NAR ; the stage moved to Station VII for pneumostatic retest and for start of systems installations.²⁷

October 26: The AS-501 space vehicle flight readiness test (FRT) ended at KSC and preparations started for fueling the vehicle.²⁸

October 27: The S-IB-11 stage arrived at MSFC/Huntsville from MAF.²⁹

October 28: Installation of all five J-2 engines in the S-II-6 stage ended at Seal Beach.³⁰



UPRATED SATURN I STAGES IN VEHICLE CHECKOUT LABORATORY

Three Uprated Saturn I S-IVB stages, S-IVB-205, -206, and -207, are visible in this photograph of the Vehicle Checkout Laboratory at Sacramento. McDonnell Douglas personnel are completing post-storage modification of the S-IVB-205 pictured on the roll dolly in the foreground.

October 30: IBM removed the S-IU-504 from the checkout stand and turned it over to NASA for inspection prior to storage.³¹

October 31: NAR transported the completed S-II-TS-B structure from Seal Beach to Santa Susana where instrument installations and preparations for placement of the structure in the test stand commenced.³²

- McDonnell Douglas performed an abbreviated post-firing checkout of the S-IVB-505N stage and declared the stage "Ready for Storage." The stage would remain in the stand pending removal of the S-IVB-206 from the VCL.³³

In October: Post-storage modification of the S-IVB-205 stage began in the VCL at SACTO.³⁴

- The S-IC-5 stage was placed in storage at Michoud following refurbishment and post-static checkout.³⁵
- MSFC Director, Dr. Wernher von Braun, approved a revised charter for MTF. The new charter clarified the function of MTF in the area of on-site surveillance of stage and support contractors' performance of assigned work scopes.³⁶

NOVEMBER 1967

November 1: NASA selected Bendix Corporation to negotiate a contract for design, development, qualification, and delivery of long-duration, cryogenic gas storage tanks for the first 56-day manned flight in the AAP. The tanks would be a critical pacing item for long-duration manned flights in AAP. Completion of negotiations would permit an early award if the project was continued by NASA as programmed.¹

- CCSD test personnel installed S-IB-11 in the STTE at MSFC's test site and began preparations for static testing the stage.²

November 3: IBM completed checkout of the S-IU-209 unit. The unit remained on the checkout stand at IBM/Huntsville undergoing government acceptance inspection.³

- The S-IVB-506N systems checkout, initiated by McDonnell Douglas in September, was satisfactorily concluded at the Space Systems Center.⁴

November 4: NASA Associate Administrator for Manned Space Flight, Dr. George Mueller, announced a revised Apollo mission schedule of six flights in 1968 and five in 1969 using the "200-series" (Up-rated Saturn I) and the "500-series" (Saturn V) launch vehicles to test and qualify Command, Service, and Lunar Modules (C&SM and LM). The schedule for 1968 would include: Apollo/Saturn 204 (AS-204), first unmanned test of LM in earth orbit; AS-502, second unmanned flight test of Saturn V and Apollo C&SM; AS-503, third unmanned test of Saturn V and C&SM; AS-206, second unmanned flight test of LM in earth orbit; AS-205, first manned Apollo flight, a 10-day mission to qualify C&SM for further manned operations; AS-504, first manned Apollo flight on Saturn V, to provide experience with both C&SM and LM, including crew transfer from C&SM to LM and rendezvous and

docking. The 1969 schedule would include five manned flights (AS-505 through AS-509) with the first four programmed as lunar mission development flights or lunar mission simulations--AS-509 being that on which the lunar landing would be made. Possible the lunar landing might be delayed until one of the remaining six Saturn V flights beyond 1969. All opportunities to accelerate progress in 1969 toward manned flights and a rapid accumulation of manned experience with the Apollo/Saturn system would be sought, Mueller said.⁵

November 4: The first part of the two-part terminal countdown for the AS-501 launch, known as the launch vehicle precount, started at -104 hours at 12:00 a.m. EST.⁶

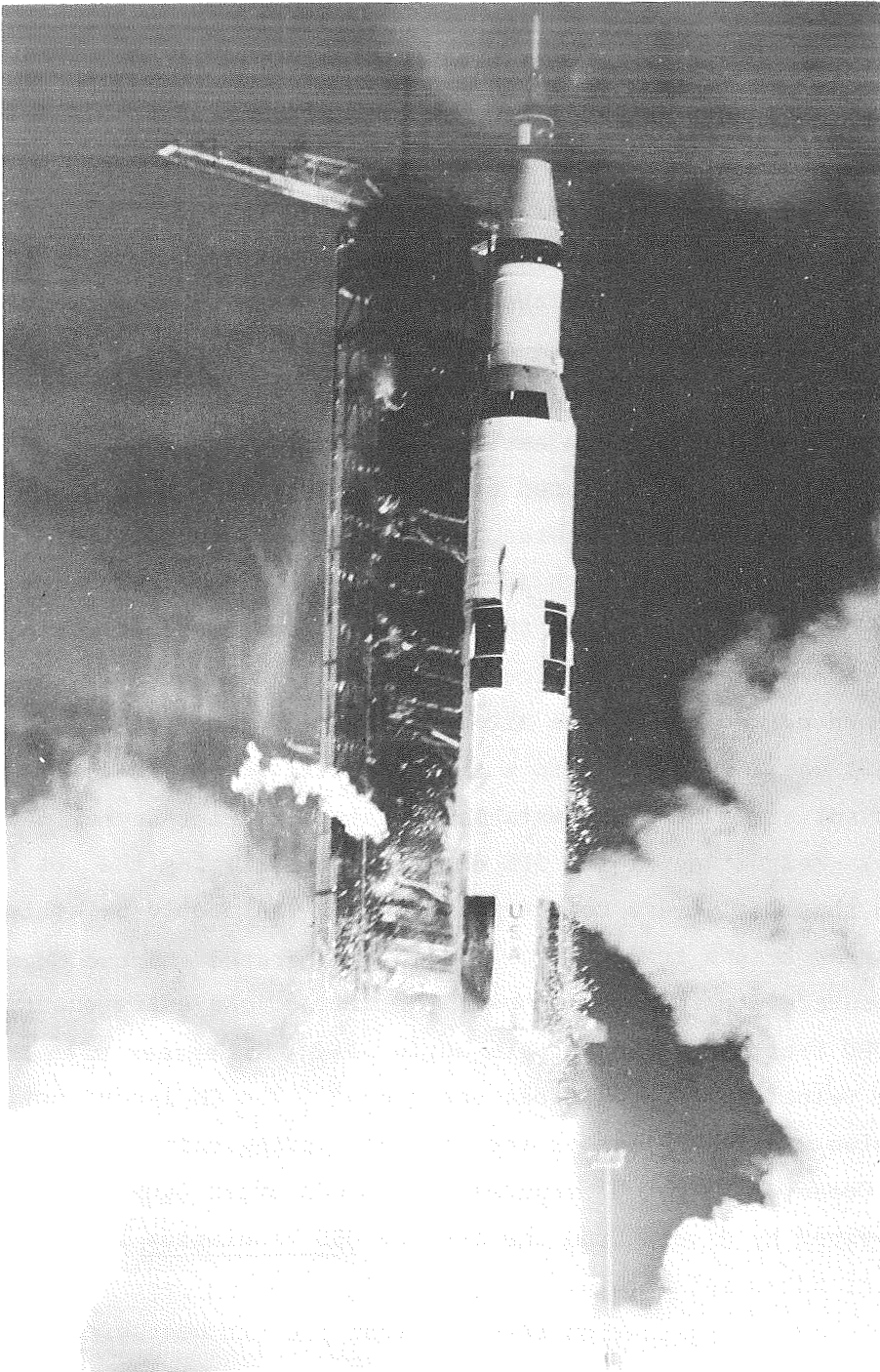
November 6: The second part of the terminal countdown for the AS-501 launch picked up at -49 hours at 11:30 p.m. EST and progressed through all scheduled holds without dropping behind in the count.⁷

November 9: NAR began vertical buildup of the S-II-9 stage propellant tanks.⁸

- MSFC's Director announced by letter to all MSFC personnel an expected cut of 700 people in the Center's authorized employment strength. He advised that the cut might become necessary because of a reduction in NASA's FY-1968 budget to be announced by the Senate Appropriations Committee.⁹

- NASA achieved a critical point in the Apollo Program with the Apollo 4 flight (AS-501), an "all-up" launch from LC-39 at KSC at 7:00 a.m., EST. The flight, termed "perfect," demonstrated that the spacecraft, heatshield, and lunar rocket met program requirements.

S-IC stage LOX depletion sensors signaled S-IC outboard engine cutoff at 150.8 seconds after launch. At S-IC separation, eight



FIRST SATURN V FLIGHT

AS-501, the first Saturn V flight vehicle with the Apollo 4 spacecraft as payload, rises from Launch Complex 39 at KSC on November 9, at 7:00 a.m., to begin a flight termed "perfect."

ullage rockets on the S-II ignited for 3.7 seconds to provide propellant settling, followed by ignition of the S-II main engines for a burn of 378.5 seconds. S-II engine cutoff occurred at 519.8 seconds after liftoff. The S-IVB ullage motors then ignited to provide propellant seating prior to S-IVB burn, and one second later the S-II retromotors ignited. Activation of a Mild Detonating Fuse (MDF) caused stage (S-II stage and the S-IVB interstage as unit) separation which was followed by ignition of the S-IVB J-2 engine. At 675.6 seconds after launch the vehicle went into an earth parking orbit 100 nautical miles above the earth. Two revolutions later, the S-IVB reignited for a simulated translunar injection burn. The second burn, lasting 300 seconds, injected the spacecraft into an earth-intersecting orbit with an apogee of 9,301 nautical miles. C&SM/S-IVB separation occurred 600 seconds after cutoff of the S-IVB engine. Ignition of the Service Propulsion System (SPS) for a 16-second burn raised the apogee altitude to 9,767 nautical miles. The spacecraft was then aligned to a specific attitude to achieve a thermal gradient across the CM heatshield, maintained for approximately $4\frac{1}{2}$ hours. Reignition of the SPS occurred, accelerating the spacecraft to the most severe re-entry conditions that could be achieved from a lunar return trajectory. The C&SM separated and the CM was then oriented into the proper re-entry attitude. Re-entry occurred at 400,000 feet, at a flight path angle of -7.077 degrees with an internal velocity of 36,537 feet per second. The CM landed upright within nine nautical miles of the planned landing point in the Pacific Ocean, 8 hours, 37 minutes, 8 seconds after launch. The CM was recovered by divers from the carrier USS Bennington 2 hours and 14 minutes after splashdown.

Post-launch examination revealed that the aft heatshield was heavily charred, but that crew compartment heatshield charring was less than expected. The spacecraft windows were undamaged, but moisture existed between the micrometeoroid and heatshield panels

of the rendezvous window, and the spacecraft contained approximately two quarts of sea water taken in through the relief valve.

Apollo 4's flight was the first of two to three missions designed to qualify Saturn V for manned flight, and the first test of the structural integrity and compatibility of LV and spacecraft. By subjecting CM's heat shield to high heat load and heat rate, NASA was evaluating CM's design adequacy for re-entry from lunar missions--the primary objective to achieving a successful manned lunar mission. Other primary mission objectives of the Apollo 4 flight were to: confirm launch loads and dynamic characteristics; demonstrate stage separation; verify operation of LV subsystems and spacecraft subsystems; evaluate performance of LV EDS in an open-loop configuration; and demonstrate mission support facilities and operations required for launch, mission conduct, and CM recovery.

Success of Apollo 4, according to NASA Associate Administrator for Manned Space Flight Dr. George E. Mueller, had been achieved in terms of "pre-set primary objectives." Heatshield design, S-IVB restart, structural/thermal integrity, compatibility of LV and spacecraft, and ground support had been proven.¹⁰

November 9: Apollo Program Manager, Major General Samuel C. Phillips, commented on countdown operations for the AS-501: "...I was tremendously impressed with the smooth teamwork that this combined government/multi-industry team put together. You could almost feel the will with which it was being carried out. I think that's important to the progress of Apollo...perhaps even more so than some of the technical returns we'll get from this mission....Apollo is on the way to the moon."¹¹

- U.S. officials praised the successful flight of Apollo 4 (AS-501). President Johnson said that "the whole world could see the awesome sight of the first launch of what is now the largest rocket ever

flown. This launching symbolizes the power this Nation is harnessing for the peaceful exploration of space. The successful completion of today's flight has shown that we can launch and bring back safely to earth the space ship that will take men to the moon." National Aeronautics and Space Council's Executive Secretary, Dr. Edward C. Welsh, said the Nation's people "should be proud of this historic landmark in propulsion and precision, and particularly in the boost given our national space program." Looking toward the future, NASA Administrator James E. Webb praised this "successful demonstration of the devotion and high quality workmanship of over 300,000 men and women in thousands of industrial plants, laboratories, test facilities, universities and government installations. This success will permit us to move more rapidly on to a second launch." Dr. Wernher von Braun said, "No single event since the formation of the Marshall Center in 1960 equals today's launch in significance. I regard this happy day as one of the three or four highlights of my professional life--to be surpassed only by the manned lunar landing."¹²

- Blastoff of Saturn V at KSC produced one of the loudest noises in history, natural or man-made, according to Columbia University's Lamont Geological Observatory at Palisades, N.Y. Observatory physicist Dr. William Donn labeled U.S. and U.S.S.R. nuclear explosions the only louder manmade sounds and the 1883 fall of Great Siberian Meteorite as the only louder natural sounds on record.¹³

November 10: Boeing removed the S-IC-D stage from storage and erected it in the S-IC Static Test Stand at MTF for a series of fuel tank drain tests slated to occur in December.¹⁴

- Post-manufacturing checkout of the S-IC-7 stage ended with a successful simulated static firing. Boeing then placed S-IC-7 in storage at Michoud due to other work priorities at KSC and Michoud.¹⁵

November 11: IBM completed retest of the S-IU-503 unit necessitated due to the incorporation of 40 modifications since September 7.¹⁶

- NAR loaded the S-II-4 stage onboard the AKD Point Barrow for shipment from Seal Beach to MTF.¹⁷

November 12: The S-IVB-206 stage was moved from the VCL to the Beta Complex at SACTO for completion of post-storage checkout operation.¹⁸

- NAR shipped the S-II-TS-A structural assembly including the cylinders 1 and 2, common bulkhead, LOX bulkhead, aft skirt, and the simulated thrust structure, from Seal Beach to MSFC.¹⁹
- Following post-static firing tests, special tests, and modifications, the S-II-3 stage was removed from the static test stand and placed in the horizontal bay of the S-II Service Building at MTF for insulation repair, additional modifications, and further inspection.²⁰

November 13: Boeing began a retest of S-IC-3 at MAF to check out the numerous engineering change procedures incorporated since government acceptance of the stage.²¹

November 14: NASA completed its inspection of S-IU-504 and accepted the unit following correction of documentation discrepancies reflecting the "as-built" versus the "as-designed" configuration. The unit was then prepared for installation of modification kits.²²

November 15: By letter and speech Dr. Wernher von Braun gave his personal congratulations to MSFC Civil Service and contractor employees for their work in making the first Saturn V, Saturn/Apollo 501, successful in its mission. The Director, MSFC, stated "...the success of 501 gives us renewed hope for meeting the original goal of landing men on the moon in 1969."²³

November 15: The S-IC-5 stage was transferred from storage in the MAF Manufacturing Building to the Stage Test Building for post-static refurbishment and modification.²⁴

- Personnel completed flight certification of the S-II-2 stage in the VAB at KSC.²⁵
- Factory checkout of the S-IVB-506N stage was completed at Huntington Beach.²⁶
- McDonnell Douglas completed LH₂ and LOX hardware installations in the S-IVB-507 stage and began systems checkout.²⁷
- McDonnell Douglas completed LOX tank hardware installations in the S-IVB-508 stage and started stage joining operations.²⁸

November 16: Structural fabrication of the S-IU-506 began at IBM's Huntsville facility.²⁹

November 17: Chrysler personnel completed incorporation of planned block modifications to the S-IB-6 stage and initiated post-storage checkout.³⁰

- The S-IB-11 stage underwent propellant loading tests at MSFC's test site.³¹

November 20: An LH₂ Cold Flow Test ended checkout of the Beta III Test Stand at SACTO. Previous tests determining operational readiness of the stand included a final run of the ground support equipment test set conducted the week of October 12-18, and an LN₂ Cold Flow of the LOX and LH₂ systems accomplished November 14.³²

November 20: Government inspection of S-IU-209 ended and preparations began for storing the unit at IBM/Huntsville.³³

- NASA named crews for the first two manned Apollo/Saturn flights. Prime crew for AS-504 (first mission), scheduled for 1968: James A. McDivitt, commander; David R. Scott, CM pilot; and Russell L. Schweickart, LM pilot. Backup crew would be Charles Conrad, Jr., commander; Richard F. Gordon, CM pilot; and Alan L. Bean, LM pilot. Prime crew for AS-505 (second mission), scheduled for 1969: Frank Borman, commander; Michael Collins, CM pilot; and William A. Anders, LM pilot. Backup crew would be Neil A. Armstrong, commander; James A. Lovell, CM pilot; and Edwin E. Aldrin, LM pilot. A three-astronaut support team was named for each flight crew: for AS-504--Edgar D. Mitchell, Fred W. Haise, Jr., and Alfred M. Worden; and for AS-505--Thomas F. Mattingly II, Gerald P. Carr, and John S. Bull.³⁴

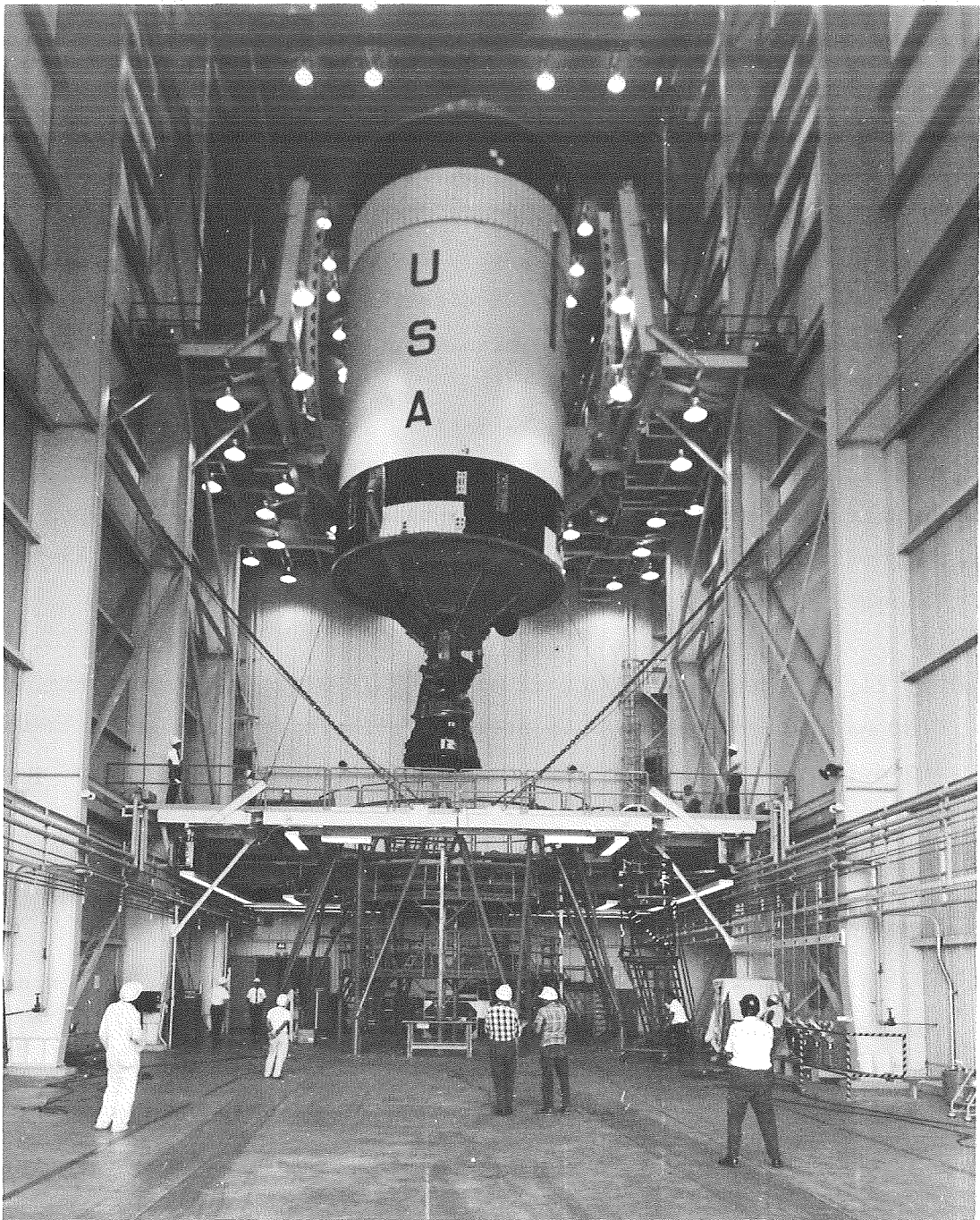
November 21: Post-storage checkout of the S-IB-6 stage began at MAF. CCSD had placed the stage in storage following the change in launch schedules resulting from the AS-204 accident.³⁵

- A successful AST completed the S-IVB-503N post-storage checkout by McDonnell Douglas at SACTO.³⁶

November 22: The S-IC-7 stage was placed in storage at Michoud to await shipment to the MTF static firing site.³⁷

- McDonnell Douglas installed the S-IVB-206 stage in the newly refurbished Beta III Stand at SACTO and began preparations for static firing the stage.³⁸

November 23: The AS-502 spacecraft, C&SM 020, arrived on dock at KSC.³⁹



S-IVB-206 IN PROCESS OF TRANSFER

Removal of the S-IVB-206 from the Vehicle Checkout Laboratory is watched closely by McDonnell Douglas personnel. The stage is being transferred to the Beta Complex for completion of checkout operations prior to storage.

November 26: S-II-4, more powerful and somewhat lighter than previous S-II flight stages, arrived at MTF from the NAR Corporation, Seal Beach, California. Each J-2 engine of the stage had been uprated to produce 5,000 more pounds of thrust than previous J-2 engines. The lighter weight resulted from use of thinner propellant tank walls and lighter weight structures.⁴⁰

November 27: At MTF the S-II-4 was positioned in the A-2 Static Test Stand where prestatic checkout and preparations for acceptance tests began.⁴¹

November 28: The S-IVB-505N was removed from the Beta I Test Stand and placed in storage in the VCL.⁴²

- Two MSFC employees received special awards of achievement from the Alabama section, American Institute of Aeronautics and Astronautics. William C. Snoddy, a physicist in the Center's Space Sciences Laboratory, received the Hermann Oberth Award for outstanding individual achievement in the field of astronautics and for promotion and advancement of aeronautical studies. Dr. Eberhard V. M. Rees, MSFC's Deputy Director, Technical, received the General Holger N. Toftoy Award for outstanding technical management in the fields of aeronautics and astronautics.⁴³

November 29: Vertical assembly of the S-II-8 stage ended with NASA's acceptance of the closeout weld. NAR began preparations for pneumostatic testing of the stage.⁴⁴

- Structural testing of the S-II-TS-C test unit started at MSFC to qualify the aft skirts for stages S-II-4 through S-II-10 for both unmanned and manned flights.⁴⁵

November 29: The S-IVB-503N stage was removed from the South Tower of the VCL at SACTO and placed on a roll dolly for modifications prior to shipment to KSC.⁴⁶

- In a speech to all employees, MSFC Director, Dr. von Braun, told of the official administrative decisions necessary because of a reduction in NASA's FY 1968 budget and also because of the changing nature of MSFC as development of Saturn launch vehicles neared completion. He stated that NASA had directed MSFC to: (1) reduce personnel by 700, to be effective January 13, 1968; (2) reduce travel by 10 per cent; and (3) reduce all other administrative costs by 15 per cent. Personnel reduction would include 345 wage board and technicians, 120 clerical, 145 business and professional, and 50 engineering positions. Dr. von Braun also stated that the reduction in civil service personnel would be accompanied by a proportionate reduction in support contractor personnel, effective also by January 13, 1968.⁴⁷

In November: Dr. William A. Mrazek, Assistant Director for Engineering at MSFC, received an appointment to NASA's Research and Technology Advisory Committee on Space Vehicles. The Committee was one of several advising NASA Headquarters in various technical areas, especially in advanced research and technology.⁴⁸

- NASA established a revised Apollo launch schedule after a thorough reassessment of program requirements and capabilities. The pacing items in the revised schedule were identified as the Command, Service and Lunar Modules. The new schedule called for up to three Up-rated Saturn I and three Saturn V flights in 1968 and five Saturn V flights in 1969. This revised base included as mainline missions an additional unmanned lunar module development mission and a third unmanned Saturn V mission. Although this program reduced the total number of

flights preceding the lunar mission, it still enabled NASA to capitalize on success or to respond effectively in case of problems.⁴⁹

- Space Data Corporation successfully conducted the first static firing of the Super Loki Dart developed for MSFC for use as a meteorological rocket system replacing the Cajun Dart.⁵⁰
- McDonnell Douglas began systems checkout of the S-IVB-507 stage in Tower 6 of the Space Systems Center.⁵¹
- The Director, Research and Development Operations, MSFC, and the Apollo Program Manager, KSC, signed a supplement to a December 1965 support agreement providing for Saturn V swing arms and tail service masts. The supplement established basic guidelines for support by MSFC to enable Boeing, under contract to KSC, to perform all planned modifications to the Saturn V swing arms at MSFC facilities. MSFC would continue to provide Quality inspection and on-Center transportation of the arms as established under the basic agreement and would also give advisory support to Boeing in preparation of the arms for shipment to KSC.⁵²



THE S-II-TS-A IS LIFTED FROM TRANSPORTER

Workmen at MSFC are transferring the North American Rockwell-built test structure from its transporter. The structure is for use in structural tests verifying the integrity of the lightweight structures of operational S-II stages.

DECEMBER 1967

December 1: IBM personnel completed block modifications planned for S-IU-206 and began systems retest of the unit.¹

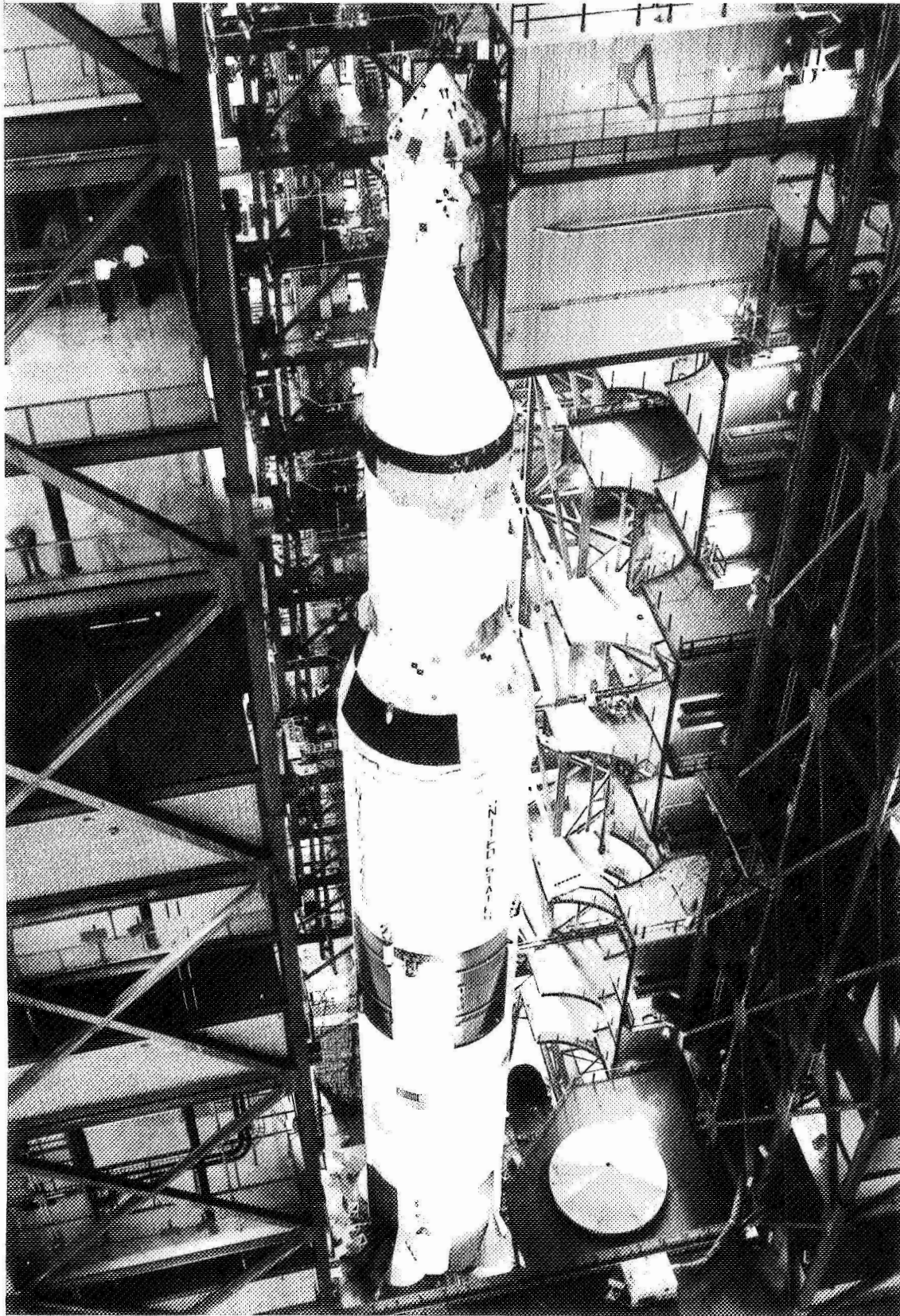
- Boeing removed S-IC-4 from storage and began incorporating modifications. The stage was scheduled to be shipped to KSC in early April 1968.²
- Construction of the S-IC B-1 Test Stand at MTF was completed and beneficial occupancy given NASA.³

December 5: A successful simulated flight test of the S-IC-3 stage at Michoud ended retest activity required because of the long post-acceptance storage period in which workmen completed modifications originally scheduled for installation at KSC.⁴

- IBM received a supplement of \$1,292,218, bringing the IU contract total to \$200,644,441. IBM received the supplement for configuration management of 27 IU's for use on the Uprated Saturn I and Saturn V.⁵

December 6: KSC personnel completed prelaunch tests certifying the S-IU-502 as flightworthy.⁶

- Letters of notification were sent to MSFC individuals affected by the reduction-in-force.⁷
- The S-II-TS-A structure fabricated by NAR at Seal Beach arrived at the MSFC dock. It was unloaded and moved to the ME Laboratory to be welded to the S-IC forward bulkhead.⁸



AS-502 IN HIGH BAY 3

Erection and mating of AS-502 in the Vehicle Assembly Building at Kennedy Space Center nears completion in December. Work platforms are recessed except for one in use during the erection of the spacecraft.

December 6: At Huntington Beach, McDonnell Douglas completed leak checks on the S-IVB-510 LOX and LH₂ tank assembly and moved the stage to the Insulation Chamber for insulation installations.⁹

December 9: Erection of the Apollo spacecraft atop the SA-502 vehicle occurred in the VAB High Bay 3 at KSC.¹⁰

December 11: NASA accepted the S-IC-3 stage from Boeing as "ready for shipment" to KSC.¹¹

- The S-IVB-503N was erected into the Low Bay Cell No. 1 at KSC to undergo receiving inspection.¹²

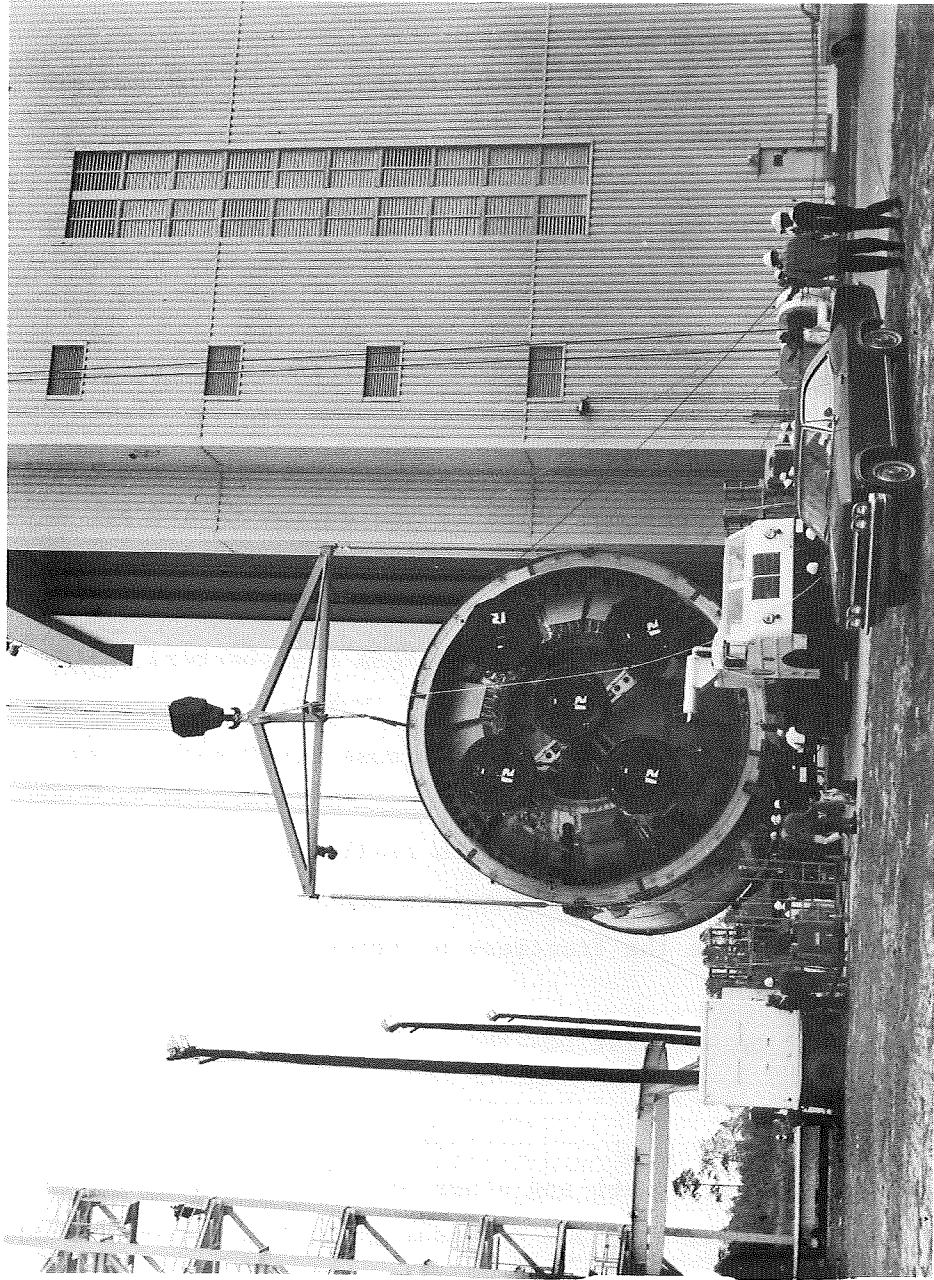
December 12: NAR personnel pneumostatically tested the S-II-8 stage.¹³

- President Lyndon B. Johnson, accompanied by NASA Administrator and Mrs. James E. Webb, other officials from NASA Headquarters, MSFC officials, and Louisiana's Governor John J. McKeithen, toured the MAF. While at MAF the President spoke to some 2,600 spectators, stating that:

"We Americans are the first to really enter and the first to understand the Twentieth Century. We will never evacuate the frontiers of space to any other Nation.

"We will be--we must be--the pioneers who lead the way to the stars."¹⁴

- NASA Administrator James E. Webb and other officials of NASA stopped briefly at MSFC on their way back to Washington, D.C., from Michoud. During his stopover Mr. Webb toured the AAP mockup area and received a briefing on various aspects of the work by Dr. von Braun and other MSFC executives.¹⁵



S-II-3 STAGE LEAVES CHECKOUT

Being lowered horizontally onto a transporter is the S-II-3 stage which has undergone post-static checkout and modification in the Vertical Checkout Building at Mississippi Test Facility. The stage will be transported to the MTF dock and shipped to KSC.

December 14: Approximately 100 representatives of industry and government met at MSFC December 11-14 to discuss and review the Orbital Workshop design. Members of the Design Review Sub-boards, specialists in their areas, explained the major workshop documentation.¹⁶

December 17: The Boeing Company Space Division completed an eight-month study to define the performance growth potential of the Saturn V and to define alternative Saturn V uprating methods for use in planning for future missions and for continuation of the Saturn program. In the final phase of the study, effort was directed toward definition in detail of the selected baseline vehicle configuration, its performance capability, and its flight environment. Necessary vehicle/facility/GSE modifications and/or additions were determined and cost requirements for development and implementation of the baseline vehicle into the space program were defined.¹⁷

December 18: A series of fuel tank drain tests began with the S-IC-D stage in the S-IC Static Test Stand at MTF.¹⁸

December 19: The S-IB-11 stage successfully performed in a short-duration static firing. The firing had a run duration of 35.508 seconds, from ignition command to outboard engine cutoff signal, with cutoff initiated by the firing panel operator.¹⁹

- Final inspection of the S-II-3 stage ended in the VCL at MTF, and preparations began for shipment of the stage to KSC.²⁰

December 20: NAR completed pneumostatic retest of the S-II-7 stage LH₂ tank, accomplished post-pneumostatic inspection, and began application of the spray-on foam insulation.²¹



S-IC-3 READY FOR SHIPMENT

The S-IC-3 is being loaded onboard the barge Poseidon at Michoud for shipment to Kennedy Space Center.

December 20: NAR completed the S-II-8 stage LOX tank cleaning and inspection and moved the stage to Station III for post-pneumostatic inspection of the LH₂ tank.²²

- Limit load tests to 128 per cent on the S-II-TS-C test article at MSFC completed structural qualification of the S-II aft skirts for S-II-4 through S-II-10 stages.²³

December 21: The AS-502 Launch Vehicle Overall Test No. 1 was satisfactorily completed in the VAB at KSC.²⁴

- The S-IC-3 stage was loaded onto the barge Poseidon at Michoud for shipment to KSC.²⁵
- The S-II-3 stage departed MTF aboard the barge, Point Barrow, en route to KSC.²⁶

December 22: MSFC awarded Mason-Rust Company a one-year \$8,990,826 contract extension for continued provision of services--including transportation, safety and security, supply, communications, and custodial services--at MAF. The extension brought the total contract value to \$39,073,652.²⁷

December 26: The S-II-3 stage which arrived at KSC on December 24 was "off loaded" from the Point Barrow.²⁸

- The Integrated Systems Checkout of the S-II-5 stage in NAR Checkout Station VIII ended and personnel began disconnecting the stage from checkout equipment.²⁹

December 27: The barge Poseidon, which departed Michoud on December 21, arrived at KSC with its cargo of the S-IC-3 stage.³⁰

December 27: Boeing moved the S-IC-4 stage from post-acceptance storage in the manufacturing area at Michoud to the Stage Test Building to begin modifications and retest activities required prior to its delivery to KSC.³¹

- McDonnell Douglas stopped modification work on the S-IVB-503N stage at SACTO, prepared the stage for shipment to KSC where remaining modifications would occur, and loaded it onboard the Super Guppy aircraft for transport. Shortly after takeoff the plane crew reported loud popping and rushing air noises and returned the plane with its cargo to Mather Air Force Base. Investigation revealed a structural problem with one of the latches on the plane's nose section.³²

December 28: Technicians completed the second Launch Vehicle overall test No. 2 on the AS-502 located in the VAB at KSC.³³

December 29: NASA/MSFC announced start of negotiations with CCSD for an extension to the S-IB stage contract to cover four additional S-IB flight stages and related services at an estimated cost of \$2.5 million. This would bring to 16 the total number of S-IB flight stages to be developed by CCSD for MSFC.³⁴

- Personnel at MAF completed a post-storage checkout of the S-IB-5 stage and shipped it to KSC.³⁵
- Post-storage checkout operations were completed, and the S-IVB-206 stage systems were reverified in a successful AST at SACTO.³⁶

December 30: The Super Guppy aircraft arrived at KSC from SACTO with the S-IVB-503N stage onboard.³⁷

December 31: In the final six months of 1967 Rocketdyne conducted 100 J-2 engine R&D tests accumulating 244.6 minutes firing time at SSFL;

conducted 35 production engine tests having a total firing duration of 74.1 minutes; and continued the J-2 engine environmental verification program at the AEDC. In this same period NASA accepted 12 J-2 production engines and allocated as government furnished equipment nine to NAR Corporation and three to McDonnell Douglas Corporation.³⁸

December 31: In the July-December 1969 period Rocketdyne conducted 122 R&D F-1 engine tests at Edwards Field Laboratory (EFL) for an accumulated firing time of 229 minutes; at MSFC's West Area Test Stand eight F-1 engine R&D tests totalled about 5.6 minutes of firing time. In this same period, Rocketdyne conducted 36 production engine tests at EFL totalling 49.7 minutes firing time and delivered 11 production engines to NASA. Engine delivery to Michoud was changed from air transport by the Super Guppy to land transport by truck.³⁹

In December: Pre-acceptance test modifications progressed on the S-IC-6 stage, which had been stored in the Stage Test Building since early September.⁴⁰

- NASA extended for one year the fixed-price contract of Aero Spacelines, Inc., for air cargo services. The \$2,725,000 extension brought the total value of the contract to \$11,591,633, and provided air transport service for oversized cargo of the Up-rated Saturn I and Saturn V launch vehicles through November 1968.⁴¹

SOURCE DOCUMENTS

J A N U A R Y

1. NASA SP-4008, Historical Office, Scientific and Technical Information Division, NASA, Astronautics and Aeronautics, 1967, Chronology on Science, Technology, and Policy, Washington, D. C., 1968, p. 2.
2. Space and Information Systems Division, North American Aviation, Inc., Saturn S-II Stage Quarterly Progress Report, First Quarter 1967, SID 63-266-46, April 1967, p. III-3; and MSFC Saturn V Program Control Office, Saturn V Semi-Annual Progress Report (January 1, 1967 - June 30, 1967), MA 001-005-2H, Oct. 2, 1967, p. 34.
3. MSFC Research and Development Operations, Research and Development Plan, Saturn V Damper System, Sept. 12, 1966, p. 1-1; and Memos, Hugh S. McCullough, MSFC R&DO Engineering Manager, AS-501 Damping System to W. A. Brooksbank, MSFC Propulsion & Vehicle Engineering Lab., R-P&VE-X, subj., "Weekly Highlights" Dec. 29, 1966 and Jan. 5, 1967.
4. MSFC Management Manual, Chapter 2-3-8, subj., "Charter - S-II Special Task Team," Jan. 5, 1967, with attachments.
5. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 25.
6. Memo, Bill H. Sneed, Chief, Saturn V Program Control Office, MSFC, to Chief, Apollo Program Planning Office, NASA, "Saturn V Weekly Report No. 3," Jan. 17, 1967; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 76.
7. Michoud Assembly Facility, Historical Report, Michoud Assembly Facility, January 1, 1967 - December 31, 1967, pp. 31 and 40-42; and MSFC Public Affairs Office, Press Release 67-6, Jan. 10, 1967.
8. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 22.
9. Ibid., p. 34.
10. Douglas Aircraft Company, Saturn S-IVB Quarterly Technical Progress Report, Jan. - Mar. 1967, DAC 56533, Mar. 1967, pp. 3, 4 and 5.
11. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. III-3.
12. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 6.
13. Ibid., p. 59.
14. Ibid., p. 38.
15. MSFC Manufacturing Engineering Laboratory, Historical Data, January-March 1967, Apr. 24, 1967, p. 2.

January (Cont'd)

16. PAO, Press Release No. 67-8, Jan. 16, 1967.
17. MAF, Hist. Rpt., 1967, p. 5.
18. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. II-1.
19. DAC, S-IVB QPR, Mar. 1967, p. 48.
20. Don Adams, III., Systems Static Test Branch, Chrysler Corporation Space Division, Saturn S-IB Stage Final Static Test Report, Stage S-IB-9, April 11, 1967, p. 5.
21. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 44; and S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. II-18.
22. DAC, S-IVB QPR, Mar. 1967, p. 53.
23. Ibid., pp. 54-55; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 52-56.
24. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 9 and 34; and PAO, Marshall Star, Vol. 7, No. 16, Jan. 11, 1967, pp. 1 and 4; and Vol. 7, No. 18, Jan. 25, 1967, p. 1.
25. ME Lab., Hist. Data, Jan. - Mar. 1967, p. 1.
26. PAO, Marshall Star, Jan. 25, 1967, Vol. 7, No. 18, p. 3.
27. DAC, S-IVB QPR, Mar. 1967.
28. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 42.
29. Ibid., pp. 35-36; and S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. II-2.
30. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 58; and Memo, Sneed to NASA Hq., "Sat. V Wkly. Rpt. No. 5," Feb. 1, 1967.
31. DAC, S-IVB QPR, Mar. 1967, p. 48.
32. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 42.
33. DAC, S-IVB QPR, Mar. 1967, p. 5 and 47.
34. Memo, Sneed to NASA Hq., subj , "Sat. V Wkly. Rpt. No. 5," Feb. 1, 1967.
35. CCSD, S-IB-9 Stage Final Static Test Report, April 11, 1967.

January (Cont'd)

36. PAO, Marshall Star, Vol. 7. No. 19, pp. 7-8; and NASA PAO, "Apollo Applications Briefing," with enclosure, subj., NASA Release 67-11, "Apollo Applications Program," Jan. 26, 1967.
37. DAC, S-IVB QPR, Mar. 1967, p. 53.
38. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 59.
39. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 5," Feb. 1, 1967; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 36.
40. Teletype, Melvin Johnson, Chief, Program Control Office, Sat. I/IB Program Office, MSFC, to Maj. Gen. Samuel C. Phillips, Apollo Program Director, NASA, subj., "Saturn IB Weekly Notes 5-67," Feb. 6, 1967.
41. NASA, Astronautics and Aeronautics, 1967, p. 24.
42. NASA PAO, NASA Release No. 67-16, Jan. 28, 1967; and Apollo Accident Hearing Before the Committee on Aeronautical and Space Sciences, U. S. Senate, 19th Congress, Part I, Feb. 7, 1967, and Part II, Feb. 27, 1967.
43. Memos for the Apollo 204 Review Board, from Dr. Robert C. Seamans, Jr., Dep. Adm., NASA, Jan. 28, 1967, and Feb. 3, 1967.
44. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 44.
45. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. IV-3; and PAO, Marshall Star, Vol. 7, No. 19, Feb. 1, 1967, p. 10.
46. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 6.
47. Ibid., p. 45.
48. Ibid., p. 59

F E B R U A R Y

1. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 5-67," Feb. 6, 1967.
2. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 22.
3. NASA PAO, Releases 67-21, and 67-22.
4. MAF, Hist. Rpt., 1967, p. 10; and Launch Systems Branch, Space Division, The Boeing Co., Saturn V First Stage Annual Progress Report, FY-1967, July 28, 1967, D5-12601-4, p. vii.

February (Cont'd)

5. ME Lab., Hist. Data, Jan. - Mar. 1967, p. 1.
6. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 6-67", Feb. 13, 1967.
7. Ibid., "Sat. IB Wkly. Notes 7-67," Feb. 20, 1967.
8. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 41.
9. MSFC Test Laboratory, Monthly Progress Report, February 1 - February 28, 1967, p. 3.
10. DAC, S-IVB QPR, Mar. 1967, p. 5.
11. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, pp. IV-1 - IV-2.
12. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 36; and Test Lab., MPR, Feb. 1967, p. 2.
13. Mississippi Test Facility, Historical Report, January 1 - December 31, 1967, (draft); and Memo, Sneed to NASA Hq., "Sat. V Wkly. Rpt. No. 8," Feb. 21, 1967.
14. Memo, Hermann K. Weidner, Dir., R&DO, and Edmund F. O'Connor, Dir., IO, to Dr. Wernher von Braun, Dir., MSFC, subj., "Industrial Operations-Research & Development Operations Program Management Agreement." Feb. 14, 1967, w/enc1. subj., "R&DO/IO Agreement Concerning the Detail of Project Management Personnel to the Advanced Systems Office, R&DO."
15. Memos, Sneed to NASA Hq., "Sat V Wkly. Rpt. No. 7," Feb. 15, 1967; and "Sat. V Wkly. Rpt. No. 8," Feb. 21, 1967.
16. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, pp. IV-2 and IV-4.
17. Leroy E. Butts, CCSD, Upated Saturn I S-IB Stage Assembly and Test Report, S-IB-8, RB-B8-EIR-5.1, May 1, 1967, pp. 1-3 and 4-2.
18. ME Lab., Hist. Data, Jan. - Mar. 1967, p. 1.
19. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. II-25.
20. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 30.
21. DAC, S-IVB QPR, Mar. 1967, p. 51.
22. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 36.
23. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 8-67," Feb. 27, 1967.
24. DAC, S-IVB QPR, Mar. 1967, p. 5.

February (Cont'd)

25. Memo, Hermann K. Weidner, Dir., R&DO, to Distribution C., subj., "Appointment of Deputy Director, Technical Services Office," Feb. 20, 1967.
26. Sat. V. Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 21; and ME Lab., Hist. Data, Jan. - Mar. 1967, p. 1.
27. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 52; and DAC, S-IVB QPR, Mar. 1967, p. 54.
28. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 8-67," Feb. 27, 1967.
29. DAC, S-IVB QPR, Mar. 1967, p. 53.
30. Memo, Sneed to Phillips, "Sat. V Wkly. Rpt. No. 9," Feb. 28, 1967.
31. CCSD, S-IB-9 Stage Final Static Test Report, April 11, 1967, p. 1; and Test Lab., MPR, Feb. 1967, p. 1.
32. Memo, Hugh S. McCullough, R&DO Engineering Manager, Saturn V Damper System, to W. A. Brooksbank, P&VE Lab., subj., "Wkly. Highlights," Mar. 16, 1967, with attachments.
33. DAC S-IVB QPR, Mar. 1967, p. 51; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 13.
34. MTF, Hist. Rpt., 1967, (draft).
35. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 9; and Saturn V Flight Evaluation Working Group, Saturn V Launch Vehicle Flight Evaluation Report-AS-501, Apollo 4 Mission, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-2.
36. CCSD, S-IB-9 Stage Final Static Test Report, April 11, 1967, p. 1; and Test Lab., MPR, Feb. 1967, p. 1.
37. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. II-7.
38. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 59.
39. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, pp. IV-6 - IV-7.

M A R C H

1. ME Lab., Hist. Data, Jan. - Mar. 1967, p. 1.
2. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 9-67," Mar. 6, 1967.
3. Memo, F. L. Williams, Dir., Advanced Sys. Off. MSFC, to Distribution C., subj., "Voyager Assignments, Advanced Systems Office," Mar. 2, 1967.
4. MSFC PAO, Press Release 67-42, Mar. 2, 1967.
5. MTF, Hist. Rpt., 1967; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 19.
6. ME Lab., Hist. Data, Jan. - Mar. 1967, p. 1.
7. Test Lab., MPR, Mar. 1967, p. 3.
8. Sat. V Prog. Off., Semi-Annual Prog. Rpt. Jan. - June 1967, p. 27.
9. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 10-67," Mar. 13, 1967.
10. MAF, Hist. Rpt., 1967, p. 43; and Boeing, Annual Prog. Rpt., FY 1967, p. 24
11. CCSD, S-IB-9 Stage Final Static Test Report, April 11, 1967, p. 1.
12. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 41.
13. Ibid., p. 44.
14. DAC, S-IVB QPR, Mar. 1967, pp. 5 and 47.
15. Test Lab., MPR, Feb. 1967, p. 2; and MPR, Mar. 1967, p. 2.
16. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. IV-3.
17. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 10-67," Mar. 13, 1967.
18. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 10," Mar. 7, 1967; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 74.
19. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 6.
20. Boeing, Annual Prog. Rpt., FY-1967, p. 2; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 13 and 21.

March (Cont'd)

21. CCSD, S-IB-9 Stage Final Static Test Report, Apr. 11, 1967, p. 6; and Test Lab., MPR, Mar. 1967, p. 1.
22. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 22.
23. DAC, S-IVB QPR, Mar. 1967, p. 54.
24. MTF, Hist. Rpt., 1967, (draft); and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 19.
25. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 13.
26. Test Lab., MPR, Mar. 1967, p. 2.
27. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 12-67," Mar. 27, 1967.
28. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 74.
29. NASA, Astronautics and Aeronautics, 1967, p. 81; and DAC, S-IVB QPR, Mar. 1967, p. 51.
30. Memo, E. F. O'Connor, Dir. IO, to Distribution C., subj., "Mississippi Test Facility," Mar. 20, 1967.
31. MSFC PAO, Press Releases 67-54, Mar. 20, 1967; 67-58, Mar. 22, 1967; and NASA, Release 67-66.
32. MAF, Hist. Rpt., 1967, p. 4.
33. Memo, Eberhard Rees, Dep. Dir., Technical, to J. T. Shephard, Assist. to Dir., MSFC, et al., subj., "MSFC Support to Saturn V Contingency Payload Task," Apr. 20, 1967.
34. DAC, S-IVB QPR, Mar. 1967, pp. 5 and 47; and June 1, 1967, p. 53.
35. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 13; and S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. IV-3.
36. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 61.
37. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. II-16.
38. MTF, Hist. Rpt., 1967, (draft).
39. Memo, Dr. Wernher von Braun, MSFC Director, to Distribution D., subj., "Saturn I/IB Program Office Personnel Assignments," Mar. 24, 1967.
40. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 12-67," Mar. 27, 1967.

March (Cont'd)

41. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 46.
42. DAC, S-IVB QPR, Mar. 1967, p. 54.
43. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 22; and Memo, Sneed to NASA Hq., "Sat. V Wkly. Rpt. No. 13," Mar. 29. 1967.
44. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 13; and S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. IV-3.
45. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 13.
46. Ibid., p. 27.
47. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. III-4; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 36.
48. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 13-67," Apr. 3, 1967.
49. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, pp. III-4 - III-5; and MTF, Hist. Rpt., 1967, (draft).
50. MTF, Hist. Rpt. 1967, (draft); and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 21.
51. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 38.
52. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 13-67," April 3, 1967.
53. S&ID, NAA, S-II QPR, April - June 1967, p. II-6.
54. S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. VI-38.
55. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 33.
56. Test Lab., MPR, Mar. 1967, p. 1.

A P R I L

1. TWX, Johnson to Phillips, "Sat. I/IB Wkly. Notes 13-67," April 3, 1967.
2. Ibid.
3. ME Lab., Hist. Rpt., Jan. - Mar. 1967, p. 1.

April (Cont'd)

4. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 8.
5. S&ID, NAA, S-II QPR, April - June 1967, p. II-3.
6. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 23; and Boeing, Annual Prog. Rpt., FY 1967, p. 23.
7. MTF, Hist. Rpt., 1967, (draft); and S&ID, NAA, S-II QPR, April - June 1967, p. III-1.
8. Memo, Bart J. Slattery, Chief, Public Affairs, MSFC, to Distribution B., subj., "Implementation of Apollo and AAP Designations," April 6, 1967; and NASA, Astronautics and Aeronautics, 1967, p. 125.
9. MAF, Hist. Rpt., 1967, p. 4; and TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 14-67, April 10, 1967.
10. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 14-67," April 10, 1967.
11. Don Adams, SSTB, CCSD, Saturn S-IB Stage Final Static Test Report, Stage S-IB-10, June 26, 1967, p. 3.
12. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 21.
13. Notice, NN-1136, from James E. Webb, Administrator, NASA, to Dir. MSFC et al., subj., "Disestablishment and Transfer of Functions of the NASA Office--Downey," April 9, 1967.
14. CCSD, S-IB-10 Stage Final Static Test Report, June 26, 1967.
15. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 16," April 18, 1967; and DAC, S-IVB QPR, June 1967, p. 54.
16. DAC, S-IVB QPR, June 1967, p. 57.
17. Test Lab., MPR, April 1967, p. 5.
18. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 61.
19. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 36; and S&ID, NAA, S-II QPR, Jan. - Mar. 1967, p. III-3.
20. NASA, Astronautics and Aeronautics, 1967, p. 112.
21. Dietrich W. Fellenz, Advanced Systems Off., MSFC, Reusable Aerospace Passenger Transport: Study of Incremental Development Approaches, Executive Summary Report, April 15, 1967, NASA TMX-53595, pp. 1-2.

April (Cont'd)

22. CCSD, S-IB-8 Stage, Assembly and Test Report, May 1, 1967, p. 13.
23. S&ID, NAA, S-II QPR, April - June 1967, p. II-1.
24. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 43.
25. S&ID, NAA, S-II QPR, April - June 1967, p. II-6.
26. ME Lab., Hist. Data, Jan. - Mar. 1967, p. 1.
27. DAC, S-IVB QPR, June 1967, pp. 5/6 and 53.
28. CCSD, S-IB-7 Stage Assembly and Test Rpt., July 1967, pp. 2.21-2.23.
29. Boeing, Annual Prog. Rpt., FY 1967, p. 25.
30. Memo, Sneed to NASA, Hq., subj., "Sat. V Wkly. Rpt. No. 17," April 26, 1967.
31. Memo, Eberhard Rees, Dep. Dir. Technical, to J. T. Shepherd, Assist. to Dir., MSFC, et al., subj., "MSFC Support to Saturn V Contingency Payload Task," April 20, 1967.
32. Letter, Erich W. Newbert, Assoc. Dept. Dir., Tech., MSFC, to Dr. Alfred J. Eggers, Dep. Assoc. Adm., Off. of Advanced Research & Technology, NASA, Sept. 29, 1967; and Memo, Hans Hueter, Dir. of Safety, MSFC, to Ruth Jarrell, Hist. Off., MSFC, subj., "Addition to Draft of the Official 1967 Chronology of MSFC," Dec. 1, 1969.
33. Test Lab., MPR, April 1967, p. 4.
34. MTF, Hist. Rpt., 1967, (draft).
35. ME Lab., Hist. Data, April - June 1967, p. 2.
36. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 59; and DAC, S-IVB QPR, June 1967, p. 61.
37. Memo, Hermann K. Weidner, Dir., R&DO, to Distribution D., subj., "Reassignment of Personnel in Space Sciences Laboratory," April 26, 1967.
38. M. A. Page, Advanced Systems Office, MSFC, Study of Saturn IB Improvement Programs, Executive Summary Report, TMX-53604, April 27, 1967, pp. 1 and 35.
39. CCSD, S-IB-10 Stage Final Static Test Report, June 26, 1967, p. 3.
40. Test Lab., MPR, April 1967, p. 1.
41. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 46.

April (Cont'd)

42. NASA, Astronautics and Aeronautics, 1967, p. 129.
43. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 62.
44. Ibid., p. 57.
45. M. A. Page, Adv. Sys. Off., MSFC, Sat. IB Improvement Prog., Exec. Sum. Rpt., April 1967, p. 1-2.
46. Ibid., p. 2.

M A Y

1. CCSD, S-IB-8 Stage Assembly and Test Report, May 1967, pp. 1-3.
2. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 39.
3. S&ID, NAA, S-II QPR, April - June 1967, p. II-4.
4. Test Lab., MPR, May 1967, p. 3; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 59.
5. Boeing, Annual Prog. Rpt., FY 1967, p. 24; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 27.
6. Test Lab., MPR, May 1967, p. 3; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 59.
7. CCSD, S-IB-10 Stage Final Static Test Report, June 26, 1967, p. 1.
8. NASA, Astronautics and Aeronautics, 1967, p. 149.
9. Sat. V Test Management Office, Sat. V Ground Test Plan and Status Summary, Rev. A., Sept. 15, 1967, p. 2; and Sat. V Prog. Off., Semi-Annual Prog. Rpt. Jan. - June 1967, p. 8.
10. TWX, Willaim F. LaHatte, Sat. I/IB Prog. Off., to Maj. Gen. Samuel C. Phillips, subj., "Sat. IB Wkly. Notes 20-67," May 23, 1967.
11. DAC, S-IVB QPR, June 1967, p. 61; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 59.
12. DAC, S-IVB QPR, June 1967, p. 60.
13. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 36; and S&ID, NAA, S-II QPR, April - June 1967, p. III-4.

May (Cont'd)

14. MTF, Hist. Rpt., 1967, (draft); MAF, Hist. Rpt., 1967, p. 10; and Boeing, Annual Prog. Rpt., FY 1967, p. 23.
15. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 13.
16. Boeing, Annual Prog. Rpt., FY 1967, pp. 63 and 67.
17. S&ID, NAA, S-II QPR, April - June 1967, p. III-2; and Test Lab., MPR, May 1967, p. 3.
18. S&ID, NAA, S-II QPR, April - June 1967, p. II-7.
19. CCSD, S-IB-10 Stage Final Static Test Report, June 26, 1967, p. 1.
20. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 22," June 6, 1967.
21. CCSD, S-IB-7 Stage Assembly and Test Report, July 18, 1967, pp. 1-4.
22. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 3 and 36.
23. Ibid., p. 47.
24. NASA, Astronautics and Aeronautics, 1967, p. 164.
25. Letter, Erich W. Neubert, Assoc. Dep. Dir., Tech., MSFC, to Dr. Alfred J. Eggers, Dep. Assoc. Adm., Off. of Advanced Research & Technology, NASA, Sept. 29, 1967; Memo, Wernher von Braun, Dir., to MSFC, Distribution SDL 2, subj., "MSFC Safety Function," Nov. 20, 1968; and Memo, Hans Hueter, Dir. of Safety, MSFC, to Ruth Jarrell, Hist. Off., MSFC, subj., "Addition to Draft of the Official 1967 Chronology of MSFC," Dec. 1, 1969.
26. Sat V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 31-32.
27. Boeing, Annual Prog. Rpt., FY 1967, p. 24.
28. DAC, S-IVB QPR, June 1967, p. 54; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 61.
29. Sat. V. Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 57.
30. Ibid., p. 61.
31. Ibid., p. 62.
32. Ibid., p. 80.

J U N E

1. Test Lab., MPR, June 1967, p. 1.
2. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 9.
3. PAO, Press Release 67-116, June 2, 1967.
4. MTF, Historical Rpt., 1967, (draft); and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 23.
5. Marshall Star, Vol. 7, No. 37, June 7, 1967, p. 1.
6. S&ID, NAA, S-II QPR, April - June 1967, p. I-1; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 34.
7. CCSD, S-IB-10 Stage Final Static Test Report, June 26, 1967.
8. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 23-67," June 13, 1967.
9. MAF, Hist. Rpt., 1967, p. 2.
10. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 23," June 14, 1967.
11. MAF, Hist. Rpt., 1967, p. 4; and Test Lab., MPR, June 1967, p. 1.
12. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 23," June 14, 1967.
13. Test Lab., MPR, June 1967, p. 1.
14. NASA, Astronautics and Aeronautics, 1967, p. 187.
15. ME Lab., Hist. Data, April - June 1967, p. 1.
16. NASA, Astronautics and Aeronautics, 1967, p. 189.
17. DAC, S-IVB QPR, June 1967, p. 61; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 61.
18. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 45.
19. TWX, Johnson to Phillips, subj., "Sat. IB Wkly. Notes 25-67," June 26, 1967; and DAC, S-IVB QPR, June 1967, p. 60.
20. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 9-10.

June (Cont'd)

21. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 25; and Boeing, Annual Prog. Rpt., FY 1967, p. 24.
22. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 28.
23. TWX, Johnson to Phillips, subj., "Sat. IB Wkly. Notes 25-67," June 26, 1967.
24. NASA, Astronautics and Aeronautics, 1967, p. 192.
25. Ibid., p. 193; and PAO, Press Release 67-130, June 26, 1967.
26. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 47.
27. S&ID, NAA, S-II QPR, April - June 1967, p. II-3.
28. DAC, S-IVB QPR, June 1967, p. 60.
29. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 50-51.
30. PAO, Press Release No. 67-132, June 26, 1967; Marshall Star, Vol. 7, No. 40, June 28, 1967.
31. MTF, Hist. Rpt., 1967, (draft); Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 25.
32. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 43.
33. PAO, Press Releases 67-136, and 67-138, June 30, 1967.
34. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 50-66.
35. Ibid., pp. 68-72.
36. Ibid., p. 46.
37. Boeing, Annual Prog. Rpt., FY 1967, p. 39.

J U L Y

1. PAO, Press Release 67-145, July 11, 1967.
2. Saturn V Test Management Office, Saturn V Ground Test Plan and Status Summary, Rev. A., Sept. 15, 1967, p. 26; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 82.
3. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 16.
4. DAC, S-IVB QPR, Sept. 1967, p. 57.
5. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 62-63.
6. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 27-67," July 10, 1967; and DAC, S-IVB QPR, Sept. 1967, p. 63.
7. Memo, signed by Eberhard Rees for Dr. Wernher von Braun, Dir., MSFC, to Distribution C., subj., "Coordination of Range Safety," July 6, 1967.
8. DAC, S-IVB QPR, Sept. 1967, p. 64; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 65.
9. ME Lab., Hist. Data, July - Sept. 1967, p. 2.
10. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 27-67," July 10, 1967.
11. S&ID, NAA, S-II QPR, July - Sept. 1967, p. IV-2; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 16.
12. S&ID, NAA, S-II QPR, July - Sept. 1967, p. II-1; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 40.
13. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 28.
14. Ibid., p. 16.
15. DAC, S-IVB QPR, Sept. 1967, p. 64; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 64.
16. CCSD, S-IB-7 Stage, Assembly and Test Report, July 18, 1967, pp. 1-4 and 2-24.
17. DAC, S-IVB QPR, Sept. 1967, p. 64.
18. Memo, William Tier, Mgr., Sat. I/IB Program, MSFC to Distribution SDL-3, subj., "Saturn I/IB Program Office Personnel Assignments." July 20, 1967.

July (Cont'd)

19. MAF, Hist. Rpt., 1967, p. 29; and Boeing, Annual Prog. Rpt., FY 1968, p. 4.
20. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, pp. 78-80; and July - Dec. 1967, p. 83.
21. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 6; and Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-3.
22. Boeing, Annual Prog. Rpt., FY 1968, p. 27.
23. PAO, Press Release 67-151, July 24, 1967.
24. TWX, Johnson to Phillips, subj., "Sat. IB Wkly. Notes 29-67," July 25, 1967; and TWX, Johnson to Phillips, subj., "Sat. IB Wkly. Notes 30-67," August 1, 1967.
25. TWX, Johnson to Phillips, subj., "Sat. IB Wkly. Notes 30-67," August 1, 1967.
26. DAC, S-IVB QPR, Sept. 1967, p. 57.
27. Ibid., p. 64.
28. MTF, Hist. Rpt., 1967, (draft).
29. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 27-28.
30. Ibid., p. 40; and S&ID, NAA, S-II QPR, July - Sept. 1967, p. III-1.
31. NASA, Astronautics and Aeronautics, 1967, p. 220.
32. Ibid., p. 220; PAO, Marshall Star, Vol. 7, No. 45, p. 4; and O. M. Hirsch, Manager, Contracts Office, Program Management, MSFC, "Comments to Initial Draft, Nov. 21, 1969."
33. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 40; and MTF, Hist. Rpt., 1967, (draft).
34. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 83.
35. Sat. V Prog. Off., Semi-Annual Prog. Rpt., Jan. - June 1967, p. 8; and Sat. V Ground Test Plan and Status Summary, Rev. A., Sept. 5, 1967, p. 2.

July (Cont'd)

36. Memo, Harry H. Gorman, Dep. Dir. Adm., MSFC to Distribution SDL-2 subj., "Memorandum of Agreement--KSC Utilization of Selected MSFC Personnel," August 2, 1967, w/enc. of same subj., signed July 28, 1967, by George A. Van Staden, Dir. of Adm., KSC, and July 31, 1967, by Edward D. Mohlere, Asst. to Dep. Dir., Tech., MSFC.

37. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 49.

38. NASA CR-61238, June 30, 1968, Bruce Bollermann and Robert L. Walker, Space Data Corp., Super Loki Dart Meteorological Rocket System.

A U G U S T

1. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 6-7; and Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-3.

2. Saturn V Ground Test Plan and Status Summary, Rev. A., Sept. 15, 1967, p. 20; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 21.

3. TWX, Johnson to Phillips, subj., "Sat. IB Wkly. Notes 32-67," August 14, 1967.

4. Ibid.

5. DAC, S-IVB QPR, Sept. 1967, p. 64.

6. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 7; and Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-3.

7. DAC, S-IVB QPR, Sept. 1967, p. 63.

8. NASA, Astronautics and Aeronautics, 1967, p. 235; and PAO, Marshall Star, Vol. 7, No. 46, Aug. 9, 1967, p. 4.

9. ME Lab., Hist. Data, July - Sept. 1967, p. 1.

10. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 65.

11. Ibid., p. 25; and MTF, Hist. Rpt., 1967, (draft).

August (Cont'd)

12. PAO, Press Release 67-168, Aug. 10, 1967.
13. Memo, Dr. Wernher von Braun, Dir., MSFC, to Distribution D., subj., "S-II Stage Project," Aug. 11, 1967.
14. NASA, Astronautics and Aeronautics, 1967, p. 239.
15. Memo, E. F. O'Connor, Dir., IO, MSFC, to Distribution SDL-3, subj., "Engine Program Office Personnel Change," Aug. 28, 1967.
16. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 28.
17. TWX, Johnson to Phillips, subj., "Sat. IB Wkly. Notes 33-67," Aug. 21, 1967.
18. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 72.
19. MAF, Hist. Rpt., 1967, p. 14; and Boeing, Annual Prog. Rpt., FY 1968, p. 26.
20. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 72.
21. Ibid., p. 65.
22. Ibid., pp. 67 and 69; and DAC, S-IVB QPR, Sept. 1967, p. 5.
23. ME Lab., Hist. Data, July - Sept. 1967, p. 1.
24. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 7; and Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-3.
25. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 59.
26. Ibid., p. 70.
27. Memo, Dr. Wernher von Braun, Dir., MSFC, to All Basic Organizations, subj., "MSFC Launch Vehicle Representative for Apollo 4 (AS-501)," Aug. 21, 1967.
28. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 21.
29. DAC, S-IVB QPR, Sept., p. 65; and Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 34," Aug. 29, 1967.

August (Cont'd)

30. TWX, Johnson to Phillips, "Sat. IB Wkly Notes 34-67," Aug. 29, 1967.
31. PAO, Marshall Star, Vol. 7, No. 48, Aug. 23, 1967, p. 4.
32. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 24-25; and Boeing, Annual Prog. Rpt., FY 1968, p. 27.
33. DAC, S-IVB QPR, Sept. 1967, pp. 4 and 6.
34. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 8-9; and Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-3.
35. Boeing, Annual Prog. Rpt., FY 1968, p. 23.
36. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 35-67," Sept. 5, 1967.
37. Memo, Dr. Wernher von Braun, Dir., MSFC, to Directors, Mgrs., and Chiefs, of Basic Organizations, subj., "MSFC ADP Management Decision Group," Aug. 30, 1967.
38. Sat. V. Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 67; and DAC, S-IVB QPR, Sept. 1967, p. 65.
39. Letter, Erich W. Neubert, Assoc. Dep. Dir., Tech., MSFC, to Dr. Alfred J. Eggers, Dep. Assoc. Adm., Off. of Advanced Research & Technology, NASA, Sept. 29, 1967; and Memo, Hans Hueter, Dir. of Safety, MSFC, to Ruth Jarrell, Hist. Off., MSFC, subj., "Addition to Draft of the Official 1967 Chronology of MSFC," Dec. 1, 1969.

S E P T E M B E R

1. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 28.
2. PAO, Press Release 67-181, Sept. 1, 1967.
3. Sat. V. Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 69.
4. DAC, S-IVB QPR, Sept. 1967, p. 58; and DAC, S-IVB QPR, Dec. 1967, p. 53.
5. MTF, Hist. Rpt., 1967, (draft); and Memo, Sneed to NASA Hq., subj., "Sat. V. Wkly. Rpt. No. 26," Sept. 4, 1967.
6. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 82.
7. Ibid., pp. 44-46; and S&ID, NAA, S-II QPR, July - Dec. 1967, p. II-3.

September (Cont'd)

8. Boeing, Annual Prog. Rpt., FY 1968, p. 28.
9. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 26-27; Boeing, Annual Prog. Rpt., FY 1968, p. 27; and MTF, Hist. Rpt., 1967, (draft).
10. ME Lab., Hist. Data, Oct. - Dec. 1967, p. 1.
11. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 22-23.
12. Ibid., p. 24.
13. MTF, Hist. Rpt., 1967, (draft); and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 27.
14. DAC, S-IVB QPR, Sept. 1967, p. 57.
15. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 86.
16. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 38-67," Sept. 26, 1967.
17. S&ID, NAA, S-II QPR, July - Sept. 1967, p. I-3.
18. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 29.
19. S&ID, NAA, S-II QPR, July - Sept. 1967, p. I-3.
20. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 51-52; and S&ID, NAA, S-II QPR, July - Sept. 1967, p. II-3.
21. S&ID, NAA, S-II QPR, July - Sept. 1967, p. II-4.
22. Ibid., p. I-1; and PAO, Press Release No. 67-193, Sept. 20, 1967.
23. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 38," Sept. 28, 1967; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 41-42.
24. Letter, Erich W. Neubert, Assoc. Dep. Dir., Tech., MSFC, to Dr. Alfred J. Eggers, Dept. Assoc. Adm., Off. of Advanced Research & Technology, NASA, Sept. 29, 1967; and Memo, Hans Hueter, Dir. of Safety, MSFC, to Ruth Jarrell, Hist. Off., MSFC, subj., "Addition to Draft of the Official 1967 Chronology of MSFC," Dec. 1, 1969.
25. NASA, Astronautics and Aeronautics, 1967, p. 278.
26. Memo, Arthur Rudolph, Mgr., Sat. V. Program, MSFC, to Dir., Mgrs., and Chiefs of Organizations through Branch Level, subj., "Appointment of Mr. Roy E. Godfrey as Manager, S-II Stage Project," Sept. 22, 1967.

September (Cont'd)

27. PAO, Press Release No. 67-196, Setp, 26, 1967.
28. PAO, Marshall Star, Vol. 7, No. 51, Sept. 13, 1967, p. 3; and Vol. 8, No. 2, Sept. 27, 1967, pp. 2 and 3.
29. DAC, S-IVB QPR, Sept. 1967, pp. 64-65.
30. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 10.
31. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 39-67," Oct. 3, 1967.
32. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 42.
33. DAC, S-IVB QPR, Sept. 1967, p. 63.
34. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 73.

O C T O B E R

1. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 73-74.
2. ME Lab., Hist. Data, Oct. - Dec. 1967, pp. 1-2.
3. PAO, Press Release No. 67-204, Oct. 4, 1967.
4. MAF, Hist. Rpt., 1967, p. 29.
5. PAO, Press Release 67-203, Oct. 4, 1967.
6. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 69.
7. MAF, Hist. Rpt., 1967, p. 2.
8. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, pp. 59-60.
9. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 73.
10. Ibid., P. 29.
11. Ibid., p. 69.
12. NASA, Astronautics and Aeronautics, 1967, p. 300; and PAO, Marshall Star, Vol. 8, No. 5, Oct. 18, 1967, pp. 1 and 7.

October (Cont'd)

13. DAC, S-IVB QPR, Dec. 1967, pp. 4 and 62; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p.70.
14. Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-3; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 10.
15. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p 72.
16. Boeing, Annual Prog. Rpt., FY 1968, p. 4.
17. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 31.
18. PAO, Marshall Star, Vol. 8, No. 5, Oct. 18, 1967, p. 2.
19. DAC, S-IVB QPR, Dec. 1967, p. 53.
20. TWX, W. F. La Hatte, to Maj. Gen Phillips, NASA, subj., "Sat. IB Wkly. Notes 41-67," Oct. 24, 1967.
21. TWX, Johnson to Phillips, "Sat. IB Wkly Notes 2-67," Oct. 31, 1967.
22. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-7; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 59.
23. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-1.
24. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 48-49; and S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-3.
25. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 42," Nov. 1 1967; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 83 and 85.
26. PAO, Marshall Star, Vol. 8, No. 11, Nov. 29, 1967, p. 1.
27. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-5.
28. Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 1, 1968, p. 3-3.
29. Don Adams, III., Systems Static Test Branch, CCSD, Saturn S-IB Stage Final Static Test Report, Stage S-IB-11, May 27, 1968. p. 3.

October (Cont'd)

30. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 51.
31. Ibid., p. 85.
32. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-8; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 38.
33. DAC, S-IVB QPR, Dec. 1967, p. 62; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 70.
34. DAC, S-IVB QPR, Dec. 1967, p. 60.
35. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 27.
36. MTF, Hist. Rpt., 1967, (draft).

N O V E M B E R

1. PAO, Marshall Star, Vol. 8, No. 7, Nov. 1, 1967, p. 8.
2. CCSD, S-IB-11 Stage Final Static Test Report, May 27, 1968, p. 3.
3. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 44-67," Nov. 14, 1967.
4. DAC, S-IVB QPR, Dec. 1967, p. 53.
5. NASA, Astronautics and Aeronautics, 1967, p. 331; and PAO, Marshall Star, Vol. 8, No. 8, Nov. 8, 1967, p. 1.
6. Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1, Jan. 15, 1968, p. 3-3.
7. Ibid.
8. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-6.
9. PAO, Marshall Star, Nov. 29, 1967, Vol. 8, No. 11, p. 10.
10. 18th Semiannual Report to Congress, July 1 - December 31, 1967, NASA, GPO, p. 3; Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 11-15; Sat. FEWG, Sat. V AS-501 Flight Evaluation, MPR-SAT-FE-68-1 Jan. 15, 1968, pp. xxxviii-xlii; and NASA, Astronautics and Aeronautics, 1967, pp. 339-341.

N O V E M B E R

11. NASA, Astronautics and Aeronautics, 1967, p. 341.
12. Ibid., p. 341, and PAO, Marshall Star, Nov. 15, 1967, Vol. 8, No. 9, pp. 1 and 10.
13. NASA, Astronautics and Aeronautics, 1967, p. 341.
14. Boeing, Annual Prog. Rpt., FY 1968, p. 25; and MTF, Hist. Rpt., 1967, (draft).
15. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 28.
16. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 48," Dec. 13, 1967, pp. 82-83.
17. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 46.
18. DAC, S-IVB QPR, Dec. 1967, p. 60.
19. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 45," Nov. 21, 1967; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, pp. 36-37.
20. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. III-1; and MTF, Hist. Rpt., 1967, (draft).
21. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 46," Nov. 29, 1967.
22. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 85.
23. PAO, Marshall Star, Nov. 15, 1967, Vol. 8, No. 9, p. 1; and Nov. 22, 1967, Vol. 8, No. 10, p. 2.
24. Boeing, Annual Prog. Rpt., FY 1968, p. 27.
25. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 17.
26. Ibid., p. 70.
27. Ibid., p. 72.
28. Ibid.
29. Ibid., p. 88.

November (Cont'd)

30. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 45-67," Nov. 29, 1967.
31. CCSD, S-IB-11 Stage Final Static Test Report, May 27, 1968, p. 3.
32. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 63.
33. TWX, Johnson to Phillips, "Sat. IB Wkly. Notes 45-67," Nov. 29, 1967.
34. NASA, Astronautics and Aeronautics, 1967, p. 350.
35. MAF, Hist. Rpt., 1967, p. 9.
36. DAC, S-IVB QPR, Dec. 1967, p. 61; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 64.
37. Boeing, Annual Prog. Rpt., FY 1968, p. 27.
38. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 63.
39. Ibid., p. 17.
40. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 46," Nov. 29, 1967; and PAO, Marshall Star, Nov. 22, 1967, Vol. 8, No. 10, pp. 1 and 10.
41. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. III-1; and Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 46," Nov. 29, 1967.
42. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 70; and DAC, S-IVB QPR, Dec. 1967, p. 62.
43. PAO, Marshall Star, Nov. 29, 1967, Vol. 8, No. 11, p. 4.
44. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-5.
45. Ibid., p. VI-3.
46. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 64.
47. PAO, Marshall Star, Nov. 29, 1967, Vol. 8, No. 11, pp. 1 and 10.
48. Ibid., p. 2.
49. 18th Semiannual Report to Congress, July 1 - December 31, 1967, NASA, GPO. p. 4.

November (Cont'd)

50. Bollerman and Walker, Super Loki Dart Meterological Rocket System, June 30, 1968, p. 2.

51. DAC, S-IVB QPR, Dec. 1967, p. 54.

52. H. K. Weidner, Dir., R&DO, MSFC, and R. O. Middleton, Apollo Program Manager, KSC, Supplemental Agreement, subj., "To Support Agreement Between MSFC, R&DO, and KSC for Saturn V Swing Arms and Tail Service Masts--Dated Dec. 12, 1965, and To Add Support for Boeing Installation of Planned Arm Modifications," Nov. 21, 1967.

D E C E M B E R

1. TWX, Johnson, to Phillips, "Sat. IB Wkly. Notes 46-67," Dec. 4, 1967.

2. Memo, Sneed to NASA Hq., subj., "Sat. V Wkly. Rpt. No. 47." Dec. 6, 1967.

3. MTF, Hist. Rpt., 1967, (draft).

4. Boeing, Annual Prog. Rpt., FY 1968, p. 26.

5. PAO, Press Release 67-236, Dec. 5, 1967; Marshall Star, Dec. 13, 1967, Vol. 8, No. 13, p. 1; and NASA, Astronautics and Aeronautics, 1967, p. 368.

6. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 17.

7. MAF, Hist. Rpt., 1967, p. 22.

8. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 37; and S&ID, NAA, S-II QPR, Oct. - Dec. 1967. p. I-1.

9. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 74.

10. Ibid., p. 17.

11. Boeing, Annual Prog. Rpt., FY 1968, p. 26.

12. DAC, S-IVB QPR, Dec. 1967, p. 58.

13. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-5.

14. PAO, Marshall Star, Dec. 20, 1967, Vol. 8, No. 14, p. 1.

15. Ibid., p. 3.

December (Cont'd)

16. PAO, Marshall Star, Dec. 13, 1967, Vol. 8, No. 13, pp. 1. and 10.
17. Boeing Co. Space Division, Final Report-Saturn V Vehicle with 260-Inch Diameter Solid Motor Study--Summary, D5-13408-1, Dec. 18, 1967, p. 1-1.
18. Boeing, Annual Prog. Rpt., FY 1968, p. 25.
19. CCSD, S-IB-11 Stage Final Static Test Report, May 27, 1968, p. 1.
20. MTF, Hist. Rpt., 1967, (draft); and S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. III-1.
21. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-5.
22. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 56; and S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-5.
23. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. VI-3.
24. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 17; and S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. IV-11.
25. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 23.
26. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. III-1; and MTF, Hist. Rpt., 1967, (draft).
27. NASA, Astronautics and Aeronautics, 1967, p. 386; and PAO, Press Release 67-246, Dec. 22, 1967.
28. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. IV-11; and MTF, Hist. Rpt., 1967, (draft).
29. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. II-3; and Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 49.
30. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 23.
31. Ibid., p. 24.
32. Ibid., p. 65.
33. S&ID, NAA, S-II QPR, Oct. - Dec. 1967, p. IV-11.
34. PAO, Press Release 67-249, Dec. 29, 1967.
35. MAF, Hist. Rpt., 1967, p. 9.

December (Cont'd)

36. DAC, S-IVB QPR, Dec. 1967, pp. 60-61.
37. Sat. V Prog. Off., Semi-Annual Prog. Rpt., July - Dec. 1967, p. 65.
38. Ibid., pp. 77-79.
39. Ibid., pp. 76-79
40. Ibid., p. 28.
41. PAO, Marshall Star, Dec. 13, 1967, Vol. 8, No. 13, p. 10.

APPENDICES

APPENDIX A

MSFC Directory Chart

September 15, 1967

APPENDIX B

MSFC Obligations and Costs for Calendar Year 1967

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO : D. S. Akens, MS-H

DATE: July 18, 1968

FROM : Chief, Budget & Operations Branch, FIN-B

SUBJECT: MSFC obligations and costs for period January 1, 1967,
through December 31, 1967

The Marshall Space Flight Center's direct program costs and applicable indirect costs are summarized briefly as follows:

<u>Classification</u>	<u>Actual Costs</u>
<u>Direct Costs</u>	<u>(In Thousands of Dollars)</u>
Saturn I	(271)
Saturn IB	155,681
Saturn V	964,908
H-1 Engine Development	(2,075)
RL-10 Engine Development	-0-
F-1 Engine Development	(5,511)
J-2 Engine Development	2,184
Engine Support	7,831
Pegasus	148
Supporting Research and Technology	32,733
Work for other NASA Centers	10,095
Reimbursable	676
Other	16,770
Total Direct Costs	<u>1,183,169</u>
Indirect Costs	<u>69,651</u>
TOTAL COSTS	<u><u>1,252,820</u></u>

Louis E. Snyder
Louis E. Snyder

OBLIGATIONS FOR CALENDAR YEAR 1967

JANUARY 1, 1967 THROUGH DECEMBER 31, 1967

PROJECT

ACTUAL OBLIGATIONS *
(In Thousands of Dollars)

SATURN I VEHICLE

931-31	S-1 Stage	-0-
-32	S-IV Stage	-0-
-35	Instrument Unit	-0-
-39	G.S.E.	-0-
-41	H-1 Engine (Proc.)	-0-
-42	RL-10 Engine (Proc.)	-0-
-50	Vehicle Support	-0-
		<hr/>
	TOTAL	-0-
		<hr/> <hr/>

SATURN IB VEHICLE

932-31	S-IB Stage	24,563
-33	S-IVB Stage	33,049
-35	Instrument Unit	20,841
-39	G.S.E.	13,292
-41	Engine, H-1 (Proc.)	6,525
-44	J-2 Engine (Proc.)	1,866
-50	Vehicle Support	33,741
-80	Saturn IB/Centaur Design	-0-
		<hr/>
	TOTAL	133,877
		<hr/> <hr/>

SATURN V VEHICLE

933-31	S-IC Stage	138,631
-32	S-II Stage	188,257
-33	S-IVB Stage	113,223
-35	Instrument Unit	57,163
-39	G.S.E.	37,552
-43	F-1 Engine (Proc.)	89,034
-44	J-2 Engine (Proc.)	93,107
-50	Vehicle Support	167,544
		<hr/>
	TOTAL	884,511
		<hr/> <hr/>

OBLIGATIONS FOR CALENDAR YEAR 1967 (Cont'd)

JANUARY 1, 1967 THROUGH DECEMBER 31, 1967

PROJECT	ACTUAL OBLIGATIONS * (In Thousands of Dollars)
<u>ENGINE DEVELOPMENT</u>	
940-41 H-I Engine	(3,800)
-42 RL-10 Engine	-0-
-43 F-I Engine	(20,134)
-44 J-2 Engine	(6,179)
-45 C-I Engine	-0-
-50 Engine Support	7,470
-99 Propellants	<u>13,906</u>
TOTAL	<u><u>(8,737)</u></u>
 <u>FUND SOURCE SUMMARY</u>	
<u>ADMINISTRATIVE OPERATIONS</u>	<u>118,261</u>
001 Personal Services	86,300
002 Travel	2,673
003 Operation of Installation	29,288
 <u>RESEARCH AND DEVELOPMENT</u>	
004	<u>1,045,887</u>
 <u>CONSTRUCTION OF FACILITIES</u>	<u>155</u>
 MSFC TOTAL	<u><u>1,164,303</u></u>

*Includes sub-authorization issued.

APPENDIX C

MSFC Contractor Status Reports

January 31, 1967

December 31, 1967

COMPILED BY:		MSFC CONTRACTOR MANPOWER STATUS SUMMARY			DATE:
MA-MM 877-2080					January 31, 1967
ORGANIZATION	MSFC SUPPORT CONTRACTORS*				
	TOTAL ON-BOARD	ON RSA	HUNTSVILLE OFF POST GOV'T FAC	OUTSIDE HUNTSVILLE GOV'T FAC	LOCAL CONTRACTOR FACILITY
STAFF & ADM. OFFICES:					
Facilities & Design Office	46		46		
R&D OPERATIONS:					
Aero-Astroynamics Lab	253	61			192
Astrionics Lab	891	478		173	240
Computation Lab	537	515			22
Manufacturing Engr Lab	346	172		174	
Propulsion & Vehicle Engr Lab	967	733			234
Quality & Rel Assurance Lab	580	353	5	17	205
Research Projects Lab	54	26			28
Test Lab	597	542			55
INDUSTRIAL OPERATIONS:					
TOTALS	4271	2880	51	364	976
REMARKS: * Includes contractors in the following categories: 1. Prime contractor performing in-house mission support. 2. MSFC in-house Mission Support Contractors. 3. Contractor operators. 4. Fabrication Support. 5. Others in support of R&D.					
	INSTALLATION CONTRACTORS**				
Management Services Office	764	665	66		33
Technical Services Office	473	440			33
Michoud Assembly Facility	786			786	
Mississippi Test Facility	2174			2174	
TOTALS	4197	1105	66	2960	66
REMARKS: **Includes contractors in the following categories: 1. Prime Service & Maintenance Contractors--including Management. 2. Smaller Services & Maintenance Contractors. 3. Product Service Contractors. 4. Concession Contractors.					
GRAND TOTAL	8468	3985	117	3324	1042
REMARKS:					

COMPILED BY: MA-MM		MANPOWER STATUS SUMMARY SINGLE SUPPORT CONTRACTOR (INCLUDING SUBCONTRACTOR)				DATE: December 31, 1967		
PHONE: 877-2080								
LABORATORY/OFFICE	ENGINEERING SUPPORT CONTRACTOR				LOCATION OF PERSONNEL			
	CONTRACTOR	TYPE		TOTAL	ON RSA	HUNTSVILLE OFF POST	OUTSIDE HUNTSVILLE	LOCAL CONTRACTOR
		A	B					
Facilities & Design Office	Rust Engr.		31	31		31		
Aero-Astroynamics Laboratory	Northrop		280	280	61			219
Astrionics Laboratory	Sperry		825	825	545		97	183
Computation Laboratory	CSC		508	508	508			
Manufacturing Engineering Lab.	Hayes		280	280	162		118	
Propulsion & Vehicle Engr Lab.	Brown		967	967	808			159
Space Sciences Lab.	Brown		75	75	37			38
Test Laboratory	Vitro		448	448	422			26
Quality & Reliability Assur Lab.	Spaco		393	393	303			90
	FEC		120	120			20	100
	GE Apollo		68	68	10			58
	TOTALS		3995	3995	2856	31	235	873
HOUSEKEEPING SUPPORT								
OFFICE/FACILITY	CONTRACTOR		TOTAL					
Management Services Office	RCA Service Company		760		657	65	1	37
Technical Services Office	Mgmt.Serv.Inc. of Tenn.		432		412			20
TOTAL			1192		1069	65	1	57
MANAGEMENT OPERATIONS SUPPORT								
Michoud Assembly Facility	Mason-Rust		726				726	
	LTV		279				279	
Mississippi Test Facility	General Electric Co.		1746				1746	
TOTAL			2751				2751	
	TOTALS		3943		1069	65	2752	57
	GRAND TOTAL		7938		3925	96	2987	930

For definition of type A and B contracts, see Support Contract Management Manual.

REMARKS:

MA-MM RECORD COPY

APPENDIX D

MSFC Manpower Status Summaries

January 6, 1967

December 29, 1967

COMPILED BY: MA-MM 877-2080		MSFC MANPOWER STATUS SUMMARY											AS OF DATE: January 6, 1967				
ORGANIZATION	VOUCHERED CEILING (PERM)	ON-BOARD CIVIL SERVICE PERSONNEL										COM- MIT- TED	PER- MAN- ENT	MILITARY	BY LOCATION		
		PERMANENT				NON-PERMANENT									ON RSA	HIC CLINTON ETC.	OUTSIDE H'VILLE AREA
		TOTAL	CA	WB	C&E	TOT- AL	CO- OPS	YOC	SUM- MER	PART TIME	TEMPS						
Director & Deputies	24	23	23											23			
Executive Staff	72	68	68											68			
Chief Counsel	19	18	18			1	1						1	19			
Labor Relations Office	4	4	4											4			
Patent Counsel	9	9	9											9			
Public Affairs Ofc	30	29	29			3	3					1		32			
Facilities & Design Office	88	91	91			5	5						1	94		2	
Financial Management Office	181	176	176			6	3			1	2	4		182			
Management Services Office	195	194	166	28		8		1		2	5	1		189	12	1	
Manpower Utilization & Admin	120	119	119			16	2			8	6	2	1	135			
Purchasing Office	232	235	235			17	6			11				102	150		
Technical Services Office	555	551	269	282		23		11		11	1		1	574			
SUB-TOTAL	1529	1517	1207	310	0	79	20	12	0	33	14	8	4	1431	162	3	
Director, R&D Opns	7	10	10											9		1	
Experiments Office	36	29	29											29			
Operations Management Office	71	71	71									1		71			
Technical Systems Office	30	19	19											19			
Technical & Scientific Staff	3	2	2											1		1	
Advanced Systems Office	100	88	88			7	6	1				1		95			
Aero-Astroynamics Lab	342	363	348	7	8	41	40			1		1	2	395		9	
Astrionics Lab	891	873	749	122	2	22	19	1		2		13	1	885	3	7	
Computation Lab	171	171	171			11	9			2		2	1	182			
Manufacturing Engr Lab	732	742	411	331		5	3				2			732		15	
Propulsion & Vehicle Eng Lab	758	745	695	47	3	23	21			1	1	8	1	761		7	
Quality & Rel Assurance Lab	580	585	574	11		15	12			1	2	1		510	15	75	
Research Projects Lab	120	104	104			11	8	1		1	1		1	109	1	5	
Test Lab	664	658	340	318		12	11				1	3	1	668		2	
SUB-TOTAL	4505	4460	3611	836	13	147	129	3	0	8	7	30	7	4466	19	122	
Director, Industrial Operations	12	14	14										1	11		3	
Contracts Office	130	129	129			3					3	3	2	116		16	
Facilities Projects Office	8	17	17											17			
Project Logistics Office	19	18	18									1	1	15		3	
Resources Management Office	40	35	35										1	35			
Engine Program Office	106	104	104			3	2				1		2	74		33	
Saturn V Program Office	270	280	280			2					2	2	4	235		47	
Saturn I/IB Program Office	157	156	156			2	1				1	1	4	106		52	
Mississippi Test Facility	103	101	101			3	3							0		104	
Michoud Assembly Facility	257	256	256			1					1			0		257	
Mission Opns Ofc	43	38	38									1		33		5	
Saturn Apollo Appl. Office	75	58	58			1					1	2	1	58		1	
SUB-TOTAL	1220	1206	1206	0	0	15	6	0	0	0	9	10	16	700	0	521	
TOTALS	7254	7183	6024	1146	13	241	155	15	0	41	30	48	27	6597	181	646	

NOTES:

Planning	AVERAGE SALARY \$11,661	GS 14, 15, & 16
CEILING		1215
ACTUAL	11,546	1221
DIFFERENCE	-115	+6

SUMMARY	PERMANENT			NON-PERMANENT					TOTAL CIVIL SERVICE	MILITARY	LWOP	
	CLASS ACT	WAGE BOARD	C&E	CO-OPS	YOC	SUMMER	PART TIME	TEMPS.			CO-OPS	OTHERS
CEILING	7241		13	169	99	0	0	0	7522			
ON BOARD	6024	1146										132
TOTAL	7170		13	155	15	0	41	30	7424	27		
VACANCIES	71		0	14	84	0	+41	+30	98			10
COMMITTED	48		0	30	0	0	0	0	78	2		
DIFFERENCE	-23		0	+16	-84	0	+41	+30	-20			142

COMPILED BY: MA-MM 8'7-2080		MSFC MANPOWER STATUS SUMMARY												AS OF DATE: Dec. 29, 1967			
ORGANIZATION	VOUCHERED CEILING (PERM)	ON-BOARD CIVIL SERVICE PERSONNEL										COM- MIT- TED	PER- MAN- ENT	MILITARY	BY LOCATION		
		PERMANENT			NON-PERMANENT										ON RSA	HIC CLINTON ETC.	OUTSIDE H'VILLE AREA
		TOTAL	CA&PL	WB	TOT- AL	CO- OPS	YOC	SUM- MER	PART TIME	TEMPS	C&E						
Director & Deputies	23	22	22											22			
Executive Staff	67	64	64		1					1				65			
Chief Counsel	19	18	18		2	2								20			
Labor Relations Office	4	5	5											0	4	1	
Patent Counsel	9	9	9		2	1				1				11			
Public Affairs Office	29	28	28		2	1	1							30			
Facilities & Design Office	81	76	76		4	3				1			1	78		2	
Financial Management Office	175	170	170		3	2	1							173			
Management Services Office	195	188	163	25	1	1								176	11	2	
Manpower Utilization & Admin.	125	113	113		16	4	10		1	1			1	129			
Purchasing Office	225	215	215		12	9	3							92	135		
Technical Services Office	543	533	294	239	6	2	4							539			
SUB-TOTAL	1495	1441	1177	264	49	25	19	0	1	4	0	0	2	1335	150	5	
Director, R&D Ops	10	6	6											6			
Experiments Office	31	33	33											33			
Operations Management Office	60	60	60		1		1							61			
Systems Engr. Ofc	37	32	32		1		1							33			
Advanced Systems Office	90	102	102		6	4	2							108			
Aero-Astro dynamics Lab	335	329	323	6	35	32	2				1		3	364			
Astrionics Lab	880	877	778	99	30	26	3			1				899	2	6	
Computation Lab	169	175	175		18	15	2			1				193			
Manufacturing Engr Lab	700	714	406	308	7	6	1					2		708		13	
Propulsion & Vehicle Eng Lab	741	739	707	32	45	37	4			3	1	2	2	778		6	
Quality & Rel Assurance Lab	561	547	537	10	8	5	1			2		1		475	15	65	
Space Sciences Lab	116	119	119		19	18	1						1	134		4	
Test Lab	623	625	376	249	15	13	2							640			
SUB-TOTAL	4353	4358	3654	704	185	156	20	0	0	7	2	5	6	4432	17	94	
Director, Industrial Operations	18	14	14										1	12		2	
Contracts Office	128	127	127		2		2						2	114		15	
Facilities Projects Office	2	5	5											5			
Project Logistics Office	20	19	19		1		1						1	17		3	
Plng & Resources Ofc	44	41	41		2		1			1			1	43			
Engine Program Office	95	97	97		6	3	2			1			1	75		28	
Saturn Apollo Appl. Office	95	83	83		1					1			1	81		3	
Saturn I/IB Program Office	146	148	148		6	2	3			1			5	106		48	
Saturn V Program Office	319	328	328		2		1			1			3	228		102	
Michoud Assembly Facility	230	231	231		1		1							0		232	
Mission Operations Office	45	40	40											35		5	
Mississippi Test Facility	96	94	94		3	3								0		97	
SUB-TOTAL	1238	1227	1227	0	24	8	11	0	0	5	0	0	15	716	0	535	
TOTALS	7086	7026	6058	968	258	189	50	0	1	16	2	5	23	6483	167	634	
SUMMARY	PERMANENT		NON-PERMANENT							TOTAL CIVIL SERVICE		LWOP		MILITARY	NOTES: Perm. spaces for LWOP's:		
	CA&PL	WB	CO-OPS	YOC	SUMMER	PART TIME	TEMPS	C&E			CA&WB						
CEILING EOM	7086		169	105	0	0	0	0		7360			8		CC	1	
ON BOARD	6058	968													FMO	1	
TOTAL	7026		189	50	0	1	16	2		7284		CO-OPS	116		PR	1	
VACANCIES	-60		+20	-55	0	+1	+16	+2		-76		C&E's	7		ASTR	2	
COMMITTED	5		0	0	0	0	0	0		5					P&VE	1	
DIFFERENCE	-55		+20	-55	0	+1	+16	+2		-71		TOTAL	131		I-S/AA	1	
GS-14,15,16	STAFF	R&DO	IO	CENTER	AVG. SALARY		STAFF	R&DO	IO		CENTER				I-E	1	
CEILING	124	774	328	1226	PLANNING EOY		-	-	-		-			\$11,900	TOTAL	8	
ACTUAL	123	764	325	1212	ACTUAL		\$10,286	\$12,939	\$13,053		\$12,446						
DIFFERENCE	-1	-10	-3	-14	DIFFERENCE		-	-	-		-			+546			

APPENDIX E

Patents Issued to Employees of
MSFC for Calendar Year 1967

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO ✓ D. S. Akens, A&TS-MS-H

DATE April 2, 1970

FROM Chief Patent Counsel, A&TS-PAT-CH

SUBJECT Patents issued to MSFC employees during calendar
year 1967

As requested by your office, a list of patents issued to MSFC employees during calendar year 1967 is as follows:

<u>Inventor</u>	<u>Number</u>	<u>Title</u>	<u>Issued</u>
Vaughn F. Seitzinger	3, 296, 060	Highly Reflecting Unified Ceramic Thermal Insulation	1-3-67
William J. Franklin and Neil C. Martin	3, 300, 847	Weld Fixture Alignment	1-31-67
Adolf L. Herrmann	3, 302, 960	Locking Device	2-7-67
Josef F. Blumrich and Carl A. Loy	3, 304, 724	Tank Construction for Space Vehicles	2-21-67
Oscar C. Holderer	3, 306, 101	Composite Force Measuring Assembly	2-28-67
Alonza J. Davis	3, 310, 978	Fiber Optic Vibration Transducer and Analyzer	3-28-67
George L. von Pragenau	3, 310, 980	Hydraulic Support	3-28-67
Robert J. Carmody	3, 329, 799	Method for Heating of Filament Wound Containers	7-4-67

<u>Inventor</u>	<u>Number</u>	<u>Title</u>	<u>Issued</u>
Karl J. Pschera	3, 313, 716	Method for Manufacturing Metal Coated Gaskets and the Like	4-11-67
Lott W. Brantly, Jr.	3, 327, 201	Series Voltage Regulator with Protection Circuit	6-20-67
Curt P. Herold and Sam D. Stahley	3, 329, 449	Sealed Swivel Joint for Fluid Systems	7-4-67
Richard J. Stein O. H. Lange and H. R. Tubbs	3, 336, 754	Detonation Reaction Engine	8-22-67
James R. Scoggins	3, 340, 732	Fluid Flow Sensor	9-12-67
Robert J. Carmody	3, 346, 442	Plastic Curing Process	10-10-67
James E. Curry	3, 346, 515	High Temperature Stable Polymer	10-10-67
James D. Byrd	3, 354, 098	Elastomeric Silazane Materials	11-21-67
Robert L. Brown	3, 351, 760	Methods of Evaluating and Inspecting Adhesively Bonded Joints	11-7-67
Albin C. Wittmann	3, 359, 132	Centrifuge Type Tin Lead Dip and Spin Machine	12-19-67

Inez C. Purser
for L. D. Wofford, Jr.

APPENDIX F

Incentive Awards Program Data

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO : David S. Akens, MS-H DATE : February 1, 1968

FROM : Assistant Executive Secretary
Incentive Awards Committee, MA-PI

SUBJECT : Incentive Awards Program Data - Historical Report.

Attached for inclusion in the Center's historical report is Incentive Awards program data for the period January 1, 1967, through December 31, 1967.



Reuben Fryer

1 Enc:
a/s

INCENTIVE AWARDS PROGRAM DATA

Sustained Superior Performance Award nominations were received by the Incentive Awards Committee during the period covered. Thirty were approved for cash awards totaling \$9,600. The names and work locations of employees for whom awards were approved are as follows:

Edwina Y. Mendoza	Michoud Assembly Facility
Gloria P. Bourgeois	Michoud Assembly Facility
Paul W. Boudra	Michoud Assembly Facility
Robert H. Labbe	Management Services Office
Lewis M. Stone	Management Services Office
Julie M. Scott	Quality and Reliability Assurance Laboratory
James C. Blair	Aero-Astroynamics Laboratory
Frank R. Batty	Quality and Reliability Assurance Laboratory
Mildred L. Howard	Advanced Systems Office
Thomas A. Linnan	Test Laboratory
Robert Reese, Jr.	Test Laboratory
Francis M. Eddy	Engine Program Office
Raymond V. Tjulander	Engine Program Office
Fred S. Wojtalik	Astrionics Laboratory
John R. Rasquin	Manufacturing Engineering Laboratory
Charles A. Jennings	Astrionics Laboratory
James V. Geiger	Test Laboratory
Vicki A. McLemore	Quality and Reliability Assurance Laboratory
Ronald E. Morring	Test Laboratory
Edward F. Hiserodt	Manufacturing Engineering Laboratory
George D. Hopson	Propulsion and Vehicle Engineering Laboratory
James R. Martin	Purchasing Office
Olive M. Brooks	Financial Management Office
Evelyn E. Gray	Propulsion and Vehicle Engineering Laboratory
Betty W. Leak	Propulsion and Vehicle Engineering Laboratory
Muriel K. Woodman	Propulsion and Vehicle Engineering Laboratory
Jerry L. Mullins	Propulsion and Vehicle Engineering Laboratory
Foster F. Oliver	Computation Laboratory
Betty J. Davis	Quality and Reliability Assurance Laboratory
Geraldine S. Wright	Space Sciences Laboratory

Ten employees received Outstanding Performance Ratings during the period covered and their names and work locations are as follows:

Linda P. Henry	Contracts Office
James A. Downey, III	Space Sciences Laboratory
Orvel E. Nevins	Aero-Astroynamics Laboratory
Clyde D. Nevins	Propulsion and Vehicle Engineering Laboratory
Robert E. Smith	Aero-Astroynamics Laboratory
Dorothy L. Johnston	Saturn I/IB Program Office
Robert Paetz	Saturn V Program Office
George C. Bucher	Space Sciences Laboratory
Frederick W. Wagnon	Astrionics Laboratory
Gerhard B. Heller	Space Sciences Laboratory

Louis C. Thompson and Myron A. Pessin shared a \$1,000 Group Achievement Award in recognition for their suggestion to change out S-IC flight hardware.

Norman L. Cropp, Resources Management Office, Walter W. Tribble, Saturn Appolo Applications, George L. Hartselle, Saturn I/IB, Donald O. Worrell, Rodell Thacker and Charles R. Bain, Technical Services Office, shared a \$900 Group Achievement Award for their effort in producing two motion pictures for the Office of Manned Space Flight for use in congressional hearings.

Bradley P. Cartwright, Resources Management Office, Warden H. Cook, Project Logistics Office, Fred N. Willingham, Facilities Projects Office, Frank W. Dill, Contracts Office, Oakley S. Anderson, Michoud Assembly Facility, William S. Fuller, Mississippi Test Facility, Martin Koslow, Saturn V Program Office, Edward Stenbridge, Saturn I/IB Program Office, and Alpha R. Bond, Engine Program Office shared an \$800 award for their effort in the cost reduction area in addition to their regularly assigned duties.

Donald R. Bowden, Donald G. Davis, Ronald B. Paulus, Charlie F. Johnson, Gordon W. Bates and Nancy M. Neely, all of the Saturn V Program Office shared a \$1,000 Group Achievement Award for the establishment of two significant milestones in Configuration Management.

William W. Kilpatrick, Management Services Office, Charles C. Hawkins, Facilities and Design Office, Hoyt Cordes, Astrionics Laboratory, Warren G. McQueen, Computation Laboratory, William C. Sweetland, Test Laboratory, and Kenneth M. Queen and Carl A. Haaker, Technical Services Office shared an award of \$565 for their effort in the cost reduction area in addition to their regularly assigned duties.

During this reporting period, five employees received Special Service Awards for a total of \$1,850. Their names and work locations are as follows:

Gordon E. Artley
Billy P. Jones
Harold D. Porterfield

Mississippi Test Facility
Space Sciences Laboratory
Quality and Reliability Assurance
Laboratory
Mississippi Test Facility
Space Sciences Laboratory

John E. Sharkey
Lawrence H. Wood

One thousand-eleven suggestions were received. One hundred ninety-three were adopted with an estimated first year savings of \$2,122,776. Suggesters received \$17,185 in awards for adopted suggestions. The largest award, \$2,005, went to Marlin J. Berkebile, Quality and Reliability Assurance Laboratory for his suggestion recommending the use of copper tubelets over Kovar transistor leads. Estimated savings were \$952,000.

Henry Ricketts, Quality and Reliability Assurance Laboratory, received \$1,625 for devising a new and improved method for removal of conformal coating from printed circuit boards. Estimated first year savings \$571,750.

Freddie A. Rodrigue, Computation Laboratory, received \$1,150 for his idea to re-use magnetic tapes rather than storing them. Estimated first year savings were \$100,000.

Martin F. Sedlazeck, Saturn V Program Office, received \$905 for his suggestion to reduce the frequency of Saturn V MSFC/Contractor Quarterly Reviews. Estimated first year savings were \$50,450.

James M. O. Smith, Engine Program Office, received \$895 for his suggestion for a spacer support for the J-106 connector, thus eliminating the need for connector re-design. The estimated first year savings were \$38,300.

John O. Evans, Technical Services Office, received \$800 for his suggestion to modify the equipment used for rear screen projection. The estimated first year savings were \$27,887.

Willard C. Fersch, Purchasing Office, received \$770 for his idea to run qualification test on hose assemblies with insulation prior to buying insulation tooling and items. The estimated first year savings were \$23,378.

Dewey C. Simmons, Propulsion and Vehicle Engineering Laboratory, received an award of \$625 for his idea to eliminate the purchase of one high temperature furnace. The savings resulting from this idea were \$15,000.

James T. Ralston, Test Laboratory, received \$550 for his suggestion to utilize idle equipment to obtain an in-house capability of check-out and repair of servo valves. The estimated first year savings were \$11,977.

The Contracts Office won the Directors Suggestion Award Plaque each of the four quarters during 1967 for having the best suggestion performance rate.

In FY 67, the Civil Service Commission initiated a program to salute employees as "Economy Champions". The Economy Champion is an employee whose achievement or suggestion has produced first year benefits of \$10,000 or more. The employee's name is placed on the Honor Roll in the lobby of the Commission's Headquarters in Washington, D. C. along with a display depicting the cost-cutting achievement. In addition, the Economy Champion receives a letter of appreciation from CSC Chairman John W. Macy and a copy of President Johnson's salute to Economy Champions. This Center submitted five employees as Economy Champions in FY 67. They are: Freddie A. Rodrigue, Computation Laboratory; Marlin J. Berkebile, Quality and Reliability Assurance Laboratory; Willard C. Fersch, Purchasing Office; James T. Ralston, Test Laboratory; and Henry Ricketts, Quality and Reliability Assurance Laboratory. Mr. Berkebile attended a ceremony in Washington, D. C. and received his award from John W. Macy, Chairman, Civil Service Commission.

Twenty-three invention awards totaling \$8,600 approved for Center employees by the NASA Inventions and Contributions Board. C. G. Glenn, Astrionics Laboratory received \$300 for his invention entitled "Electronic Components Lead Forming Tool"; Robert O. McBrayer, Propulsion and Vehicle Engineering Laboratory, received \$100 for his invention entitled "Soft Frame Adjustable Eyeglasses"; George F. von Tiesenhausen, Advanced Systems Office, received \$100 for his invention entitled "Energy Absorbing Device"; John A. Hauser, Test Laboratory, received \$700 for his invention entitled "High Pressure Helium Purifier"; Gilbert V. Allen, Manufacturing Engineering Laboratory, received \$100 for his invention entitled "Hybrid Welding Torch and Methods"; Ernst E. Seiler, Quality and Reliability Assurance Laboratory received \$50 for his invention entitled "Method for Leakage Testing of Tanks"; Max H. Sharpe, Manufacturing Engineering Laboratory, received \$900 for his invention entitled "Process for Chemical Milling of Copper Rich and Zinc Rich Aluminum Alloys"; George D. Adams, Astrionics Laboratory, received \$200 for his invention entitled "Method and Apparatus for Fabricating Electronic Circuitry and Components"; Vaughn H. Yost, Manufacturing Engineering Laboratory, received \$400 for his invention entitled "Welding Skate and Track"; George L. von Pragenau, Astrionics Laboratory, received \$300 for his invention entitled "Apparatus for Dynamic Testing"; Bumon J. Pruett and Euple I. Palmer, Test Laboratory, shared \$100 for their invention entitled "Control System for a Pressure Balance"; Fred L. Moffitt, Quality and Reliability Assurance Laboratory, received an award of \$100 for his invention entitled "Image Magnification Adapter for Cameras"; George L. von Pragenau and Wilhelm Angele, Astrionics Laboratory, shared \$600 for their invention entitled "Apparatus for Dynamic Testing"; George A. Bailey, Astrionics Laboratory, received \$400 for his invention entitled "Magnetic Memory Matrix System", and \$300 for his invention entitled "Discrete Activity Indicator System"; Joe R. Short, Manufacturing Engineering Laboratory, received \$500 for his invention entitled "Method and Device for Preventing High Voltage Arcing in Electron Beam Welding"; Norman D. Elder and William A. Wall, Jr.,

Manufacturing Engineering Laboratory, shared \$1,500 for their invention entitled "Internal Flare Angle Gauge"; Orvil Y. Reece, Propulsion and Vehicle Engineering Laboratory, received \$400 for his invention entitled "Horizontal Cryostate for Fatigue Testing"; James F. Blanche, Astrionics Laboratory, received \$200 for his invention entitled "Electrical Feed-Through Connection for Printed Circuit Boards and Printed Cable"; Gene T. Carpenter, Quality and Reliability Assurance Laboratory received an award of \$50 for his invention entitled "Device for Measuring Products of Inertia Qutomatically"; John J. Milly, Quality and Reliability Assurance Laboratory, received \$100 for his invention entitled "Satellite Despin Device"; and Murrel D. Sladen, Quality and Reliability Assurance Laboratory, received an award of \$250 for his invention entitled "Pulse Amplitude and Width Detector".

Nine hundred thirty-eight letter of appreciation and one hundred seven letters of commendation were presented to Center employees during the period.

Following is a breakdown of NASA honorary service awards presented Center employees during the period covered:

30 year	28
25 year	143
20 year	254
15 year	293
10 year	398
5 year	149

The annual Incentive Awards Ceremony was held on October 12, 1967. Highlights of the ceremony were the presentation of candidates for the title of Miss MSFC and the first closed circuit television coverage of the ceremony. Mr. Harold K. Katz was master of ceremonies and introduced Dr. Wernher von Braun. After making his speech, he presented the following awards:

30 Year Emblems

Gervaise L. Wyss	Executive Staff
Fred G. Edwards	Propulsion and Vehicle Engineering Laboratory
Vicel A. Herron	Astrionics Laboratory
Richard B. Smith	Facilities and Design Office

25 Year Emblems

Hazel T. Carley	Computation Laboratory
Joseph V. Dunlap, Jr.	Purchasing Office
Conley E. Post	Manangement Services Office
William L. Thornevaite	Astrionics Laboratory
Frank I. Turner	Contracts Office
Sanders R. Stewart, Jr.	Facilities and Design Office

Suggestion Award

James M.O. Smith	Engine Program Office
------------------	-----------------------

Invention Award

Wilhelm Angle
George L. von Pragenau
George A. Bailey
Joe R. Short

Astrionics Laboratory
Astrionics Laboratory
Astrionics Laboratory
Manufacturing Engineering
Laboratory

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